# Middlesex Centre Settlement Area Stormwater Master Plan

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Prepared for:

Municipality of Middlesex Centre
10227 Ilderton Road, RR#2
Ilderton, Ontario N0M 2A0

Prepared by:

Stantec Consulting Ltd.
600-171 Queens Avenue
London, Ontario N6A 5J7

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Prepared by _____
(signature)

**Stephanie Bergman, MA, ENV SP**

Reviewed by _____
(signature)

**Nick Emery, P.Eng**

Approved by _____
(signature)

**Nelson Oliveira, P.Eng**

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# Executive Summary

### Introduction

The existing storm drainage infrastructure in the Municipality of Middlesex Centre (Municipality) Settlement Areas was designed and constructed on a site-by-site basis as development occurred, without the benefit of an overall stormwater management strategy. This has resulted in a fragmented drainage system that does not efficiently service the existing communities, and which has limited capacity to service future growth.

The Municipality has completed a Municipal Class Environmental Assessment (EA) following the Master Plan approach to identify necessary storm drainage system improvements to better service the existing communities and to provide a drainage servicing strategy to accommodate future growth and development within the Settlement Areas. The study area for the Master Plan includes the Settlement Areas of Arva, Birr, Ballymote, Coldstream, Denfield, Ilderton, Kilworth, Komoka, Melrose, Poplar Hill, Bryanston, and Lobo.

This study excludes the Delaware Settlement Area, which was assessed through a previous Master Planning process.

### Master Plan and Public Consultation

The intent of the Stormwater Master Plan is to address public, review agency, and First Nation community's requirements and concerns and to ensure a reasonable range of alternatives and opportunities are fairly assessed and reviewed in a public forum before being finalized and carried forward for implementation.

The Stormwater Master Plan is being undertaken in accordance with the Master Planning requirements of the MEA Municipal Class Environmental Assessment (October 2000 as amended in 2007, 2011, and 2015). Master Plans are not subject to requests from the public, agencies or First Nations communities for a Minster's Order (Part II Order). However, individual projects identified within a Class EA process can be subject to a Part II Order. As such, the Master Plan can be implemented following Council approval.

Consultation with members of the community involved the publication of the Notice of Commencement, an interactive online map which was also hosted on the Municipality's website, and two series' of Public Information Centre (PICs) hosted throughout the Municipality. The Notices of PIC were published in two consecutive editions of the Londoner and Middlesex Banner newspapers; additionally, and notices were also provided to all residents within the Settlement Areas via their water/stormwater bills. All information presented at the PICs was made available on the Municipality of Middlesex Centre website, and residents were encouraged to submit comments using the comment sheets provided. Consultation with local landowners/developers was also undertaken to address concerns over preferred alternatives presented at the PICs, and modifications were made to allow flexibility in the location of SWM facilities servicing

future developments, and to ensure that proper coordination of servicing is made during the development application process.

All project notices were mailed directly to potentially interested First Nation Communities, and follow-up communication was made to ensure that they had appropriate opportunities to review project information and provide comment. A First Nations Communications Log was completed for this project to document the communication process.

Several government agencies identified as potentially having interest in the project were added to the contact list and sent all project documentation. An Agency Communications Log was completed for this project to document the communication process. The study area is regulated by the Upper Thames River Conservation Authority (UTRCA), as well as small portions regulated by the St. Clair Region Conservation Authority, Ausable Bayfield Conservation Authority, and the Lower Thames Valley Conservation Authority, and as such they were identified as important stakeholders throughout the project. Following PIC 2, comments were received from the UTRCA that were addressed throughout the Master Plan document and documented in the Agency Communications Log.

**Phase 1 Problems and Opportunities**

Phase 1 of the Municipal Class Environmental Assessment process is to identify the problem or opportunity that has led to the undertaking of the Stormwater Master Plan. The Problem and Opportunity Statement for the Middlesex Centre Settlement Area Stormwater Master Plan is as follows:

*The Master Plan shall assess the existing drainage conditions throughout the Settlement Areas and develop an environmentally sound and sustainable strategy for addressing existing issues and accommodating future growth. The objective is to develop a Master Plan for the identified Settlement Areas that balances the following responsibilities:*

- *Reduce negative impacts of flooding on properties, where feasible;*
- *Provide adequate stormwater treatment;*
- *Minimize stormwater servicing costs; and*
- *Protect the natural environment.*

It is noted that while properly functioning storm drainage infrastructure is crucial in protecting property from flood damage and may help mitigate lot-level drainage issues, this Master Plan does not specifically address certain lot-level concerns such as high groundwater (i.e. sump pumps running continually).

**Phase 2 Existing Conditions - General Setting**

The study area includes the Settlement Areas within the Municipality of Middlesex Centre, excluding the Community Settlement of Delaware. The study area was broken down into catchment areas based on the existing storm drainage infrastructure, which consists of municipal drains and municipal storm sewers**.**

The subject Settlement Areas are comprised of mainly residential land use, with some areas of Commercial and Employment lands. Although the majority of the study area is comprised of built-out residential development, several areas of potential future development were identified based on the Municipality of Middlesex Centre Official Plan Land Use Schedules in order to address and incorporate the need for future stormwater servicing into the stormwater servicing strategy.

**Phase 2 Existing Conditions – Review of Existing Infrastructure**

A review of the existing drainage conditions was completed, and the study area was broken down into catchment areas based on the available drawings provided by the Municipality of Middlesex Centre, municipal drainage reports, topographic mapping and site visit observations. Locations of existing or potential surface ponding were identified using sewer design sheets, information provided by the Municipality, as well as collected by public response to the online survey.

**Phase 2 Existing Conditions – Socio-Economic, Cultural, and Environmental Environments**

As part of the Master Plan Class EA planning process, a general inventory of the socio-economic, cultural, and environmental conditions throughout the study area was completed. This included a desktop review of existing municipal policy documents, information on active developments, available mapping, and other published sources and information provided by the Municipality. Based on this review, recommendations for further assessment and potential permit requirements prior to implementation have been identified.

**Phase 2 Alternative Solutions**

As part of the Class EA planning process, reasonable and feasible alternative solutions to the Phase 1 Problem and Opportunity Statement are identified and described in Phase 2. The net positive and negative effects of each alternative solution are identified and evaluated. Study objectives were also developed to incorporate applicable design criteria in order to identify the preferred alternative to address the key issues identified for each of the existing drainage systems. The following provides a summary of the alternative solutions and preferred solution for each drainage area.

*Arva Development Area*

The following stormwater alternatives were developed to address the problem and opportunity statement relating to the Arva Development Area:

**Alternative 1**: Do Nothing

**Alternative 2**: Regional SWM Facility

**Alternative 3**: Local SWM Controls

**Alternative 3** “Local SWM Controls” was selected as the **preferred alternative**.

All stormwater treatment is provided to the runoff from future development in the Arva Development Area by local SWM controls. The proposed local SWM controls provide provide at-source water quality, water quantity, and erosion control treatment to the runoff from all future development and may include:

- Soakaway pits and/or bioswales to capture and infiltrate rooftop runoff;
- Underground storage to provide peak flow attenuation;
- Permeable pavement on private roadways; and
- Dry SWM ponds to provide peak flow attenuation during severe design events.

The developer's engineer will be responsible for selecting the at-source SWM control measures to treat the runoff from the future development concept. The measures must be designed to meet the post-development SWM control requirements and must be accepted by MOMC. Construction of the proposed local SWM controls will be the responsibility of the developer.

*Ballymote*

The following stormwater alternatives were developed to address the problem and opportunity statement relating to the Ballymote Settlement Area:

**Alternative 1**: Do Nothing

**Alternative 2**: On-Site SWM Controls

**Alternative 3**: Replace Drain with Storm Sewer Located in Easement

**Alternative 4**: Replace Drain with Storm Sewer Located in Medway Road

**Alternative 2** "On-Site SWM Controls" was selected as the **preferred alternative**.

Stormwater treatment is provided to the runoff from all proposed development in the Ballymote Settlement Area by proposed on-site SWM controls that limit the post-development peak discharges to pre-development magnitudes. On single family residential properties, the proposed lot level controls should be located in the front yards to reduce the risk of future home improvements such as patios, decks, and pools interfering with their operation. Construction of the proposed on-site SWM controls will be the responsibility of the development proponents.

To ensure that the proposed on-site SWM controls installed, operated and maintained, Stantec recommends the following:

- The Municipality should enact a bylaw to ensure that on-site SWM controls must be operated and maintained by the property owner. The bylaw should state that the property owner is responsible for any maintenance.
- The proposed on-site SWM controls should be registered on title to prohibit their removal or alteration.
- An development agreement should include a clause stating: "The Owner shall include in all Purchase and Sale Agreements the requirement that the buildings to be designed and constructed on all Lots in this Plan are to have on-site SWM controls installed and included in the building permit application for the Lot."

- The installation of every on-site SWM control measure will need to be inspected to ensure that they are constructed in accordance with the accepted design.

It is anticipated that MECP ECAs will not be required for the proposed on-side SWM controls since the proposed development will likely consist of single family residential lots and each proposed on-site SWM measure will only control the runoff from a single lot. However, this will need to be confirmed with the MECP by the proponent prior to development.

Both the Highbury Armitage Municipal Drain and the Ballymote East Municipal Drain will be realigned around the perimeter of the Ballymote Settlement Area. The realignment will be completed in accordance with the provisions of the *Drainage Act*. The proposed drain realignments will be the responsibility of the development proponents.

*Ilderton Drain No. 2*

The following stormwater alternatives were developed to address the problem opportunity statement relating to the Ilderton Drain No. 2 catchment:

**Alternative 1**: Do Nothing

**Alternative 2**: Drain Improvements

**Alternative 3**: SWM Pond

**Alternative 4**: SWM Pond and Downstream Storm Sewer Improvements

**Alternative 2** "Drain Improvements" was selected as the **preferred alternative**.

In accordance with the design drawings prepared by IBI, the existing 400 mm diameter concrete pipe that conveys runoff from Hyde Park Road and the upstream drainage area is replaced with a 600 mm diameter PVC pipe to provide additional conveyance from the Hyde Park Road low point and to mitigate local flooding. While this solution does not provide drainage servicing that meets Municipal standards, it can be completed within the Municipal Drain working limits and does not require land expropriation. The proposed drain improvements should be completed in accordance with the provisions of the *Drainage Act*.

The Municipality should monitor the performance of the proposed drain improvements and over the long-term, should develop a plan to acquire the lands necessary to implement Alternative 4.

During PIC #2, Stantec was notified of several drainage problems in the Meadowcreek Subdivision. Stantec subsequently met with residents on site to discuss the following concerns:

- Some homes in the subdivision have recently experienced multiple basement floods caused by sanitary backups;
- Sump pump discharges to surface result in icy conditions on roads during the winter and persistently wet lawns that are too soft to mow in the summer;
- Sump pumps run frequently;
- Persistently wet soil conditions causing premature decay of wooden fence posts;

- The west pathway from Willowridge Road to Meadowcreek Park has been previously repaired and is currently heaving; and
- Residents were concerned that development of the Clear Skies Subdivision will exacerbate their drainage issues.

Some residents have mitigated problems caused by the sump pump surface discharges by conveying them to the curb with plastic drainage tiles or discharging directly to catchbasins. Furthermore, residents have installed backflow preventers to mitigate the risk of sanitary backups.

Based on the information provided by residents and site observations, the existing drainage concerns in the Meadowcreek Subdivision are likely caused by two factors:

1. Inadequate wet weather sanitary sewer capacity; and
2. High local groundwater conditions.

Stantec recommends completion of a wet weather sanitary sewer capacity analysis to identify potential inflow/infiltration problems in the Willowcreek Subdivision and provide mitigation recommendations. The study should include analysis of the Willow Ridge Road sanitary sewer and other locations where the Municipality has received basement flooding complaints.

Homes where sump pumps run frequently were likely designed without adequate consideration for the local groundwater elevations. Urban stormwater systems are typically designed to collect and convey surface runoff from rainfall events to mitigate the possibility of surface flooding. Collecting subsurface water to lower local groundwater elevations and reduce the use of residential sump pumps is not usually considered a responsibility of the Municipality. However, given the widespread groundwater concerns in the Meadowcreek Subdivision, the Municipality should consider completing a hydrogeological investigation to document local groundwater elevations and provide mitigation recommendations.

Development of the Clear Skies Subdivision is unlikely to exacerbate the existing Meadowcreek Subdivision drainage problems. The Clear Skies Subdivision SWM Report shows that the surface runoff from the proposed development does not travel southward across Ilderton Road but is instead conveyed westward to Oxbow Creek.

*South Ilderton Development Area*

The following stormwater alternatives were developed to address the problem and opportunity statement relating to the South Ilderton Development Area:

**Alternative 1**: Do Nothing

**Alternative 2**: Single SWM Facility

**Alternative 3**: Two SWM Facilities

**Alternative 4**: On-Site SWM Controls

**Alternative 3** “Two SWM Facilities” was selected as the **preferred alternative**.

Two proposed regional SWM facilities provide all necessary stormwater treatment to the runoff from the South Ilderton Development Area. Both facilities are anticipated to be designed as wet ponds. This servicing option provides flexibility for development phasing, reduces the size of conveyance infrastructure required to carry stormwater from the west side of Hyde Park Road to the proposed outlet, and manages major flows crossing Hyde Park Road.

SWM 1 is located west of Hyde Park Road and provides all necessary treatment to the runoff from proposed development. The proposed pond will also be designed to accommodate the runoff from the external undeveloped drainage area located beyond the settlement boundary. The proposed SWM pond discharges to a proposed trunk storm sewer that conveys the treated stormwater across Hyde Park Road to the Oxbow Creek Drain.

Similarly, SWM 2 provides all necessary treatment to the runoff from the east side of Hyde Park Road and discharges to the Oxbow Creek Drain. The portion of the Hughes Charlton Drain located within the Settlement Area is abandoned and replaced with proposed storm sewers.

Based on information provided by municipal staff, water levels in the Oxbow Creek Drain tend to remain high for prolonged periods following severe storm events, resulting in high tailwater conditions at the proposed pond outlets. Consequently, the proposed ponds will need to be designed to account for the effects of high tailwater elevations, which may include:

- Providing backflow prevention at the pond outlets;
- Sizing the pond outlet control structure to account for the reduced head caused by downstream tailwater conditions; and
- Providing additional quantity control storage volume in the proposed ponds to accommodate unanticipated longer detention times.

During detailed design, consideration should be given to constructing a single outlet to the Oxbow Creek Drain to service both proposed SWM facilities. This will reduce the risk of potential impacts on the drain and corresponding permitting requirements.

*Komoka Drain No. 1*

The following stormwater alternatives were developed to address the problem and opportunity statement relating to the Komoka Drain No. 1 catchment:

**Alternative 1**: Do Nothing

**Alternative 2**: Pond Location 4 with Thames River Outlet

**Alternative 3**: Pond Location 1 with Komoka Road Outlet

**Alternative 4**: Pond Location 1 with Municipal Drain Outlet

**Alternative 5**: Pond Location 5 with Thames River Outlet

**Alternative 6**: Combine Alternatives 3 and 5

**Alternative 6** "Combine Alternatives 3 and 5" was selected as the **preferred alternative**.

Stormwater treatment for the Komoka Drain No. 1 catchment area is provided by a proposed stormwater management pond located on the west side of Komoka Road. The proposed SWM pond is a former gravel pit that will be repurposed as a wet pond designed in accordance with MECP design criteria to provide both water quality and peak flow control to the runoff from the upstream service area including:

- The Komoka Drain No. 1 drainage area,
- The proposed Glendon Drive streetscape improvements, and
- The existing commercial and residential development located southwest of the Komoka Road/Glendon Drive intersection.

Runoff from the Tunks Lane future development is treated by on-site SWM controls that discharge to the proposed Glendon Drive storm sewer.

The proposed pond discharges to an approximately 700 m long proposed outlet storm sewer on Glendon Drive that conveys the treated flows southward to the Komoka Provincial Park pond. Recently completed outlet improvements at the park pond have reduced the Provincial Park pond normal water elevation. With the structure was designed to reduce the normal water level to 228.0 m, Ontario Parks is in the process of reevaluating this target. An existing neighboring privately owned pond discharges directly to the park pond through a 400 mm diameter CSP culvert with and invert elevation of approximately 229.31 m.

Both Ontario Parks staff and the neighboring pond owner were consulted to identify concerns associated with utilizing the existing park pond outlet to convey the treated stormwater to the Thames River. Initial concerns identified by Park staff included effects on pond levels, water quality concerns, and resulting impacts on flora and fauna. Similarly, the neighboring pond owner expressed concerns regarding potential impacts on their pond water levels and the resulting effects on future development opportunities on their lands. Stantec completed a preliminary hydrologic/hydraulic assessment to evaluate the anticipated impacts. The assessment was completed based on the original Park design normal water level of 228.0 m, and the results suggest:

- No significant water quality impacts are anticipated, as the stormwater is treated in accordance with MECP standards to levels that can be discharged to the natural environment, in accordance with the Ontario *Water Resources Act*;
- No significant impact on pond water levels or drawdown times, since during the 250-year storm event, the additional flows to the existing outlet only increase the maximum calculated water surface elevations in the park pond by approximately 0.12 m; and
- No significant impact on the neighboring privately owned pond since the maximum 250-year calculated water surface elevation is 228.82 m, which is lower than the invert of the existing connecting culvert.

Ontario Parks staff noted that additional approvals will be required to utilize the existing park pond outlet, including completion of a Class EA for Provincial Parks and Conservation Reserves, that an easement would need to be acquired by the municipality from Infrastructure Ontario for both the proposed inlet and the existing outlet, and that the Municipality should work with Ontario Parks to develop an outflow agreement to formalize roles and responsibilities associated with the existing outlet.

Should the required permits and approvals, including the PPCR Class EA, not be secured for the proposed Park pond outlet, an alternate outlet may be constructed along Komoka Road as shown in Alternative 3. While this alternative is less-preferred due to the costs associated with constructing the sewer along Komoka Road, as well as the added environmental impacts associated with the new outlet to the Thames River, it should be considered as a contingency in the event the appropriate approvals cannot be secured. It is noted that a scoped Environmental Impact Study should be undertaken to assess impacts to sensitive habitats along the Thames River associated with the new outlet, along with required permits through the UTRCA.

*Komoka Drain No. 3*

The following stormwater alternatives were developed to address the problem and opportunity statement relating to the Komoka Drain No. 3 catchment:

**Alternative 1**: Do Nothing

**Alternative 2**: Service Only Proposed Development

**Alternative 3**: Service Both Existing and Proposed Development

**Alternative 2** "Service Only Proposed Development" was selected as the **preferred alternative**.

A proposed stormwater management facility located on the north side of Oxbow Drive and east of the CN railway line will provide all necessary stormwater treatment to the runoff from the proposed development located west of Komoka Road. Runoff from more frequent storm events will be attenuated in the facility and discharged to Komoka Drain No. 3, based on the available municipal drain capacity. Runoff from severe storm events may be discharged to the existing overland flow route that conveys surface flows to the downstream CP Rail culvert.

Since Komoka Creek supports a coldwater fishery, the proposed facility will mitigate potential temperature impacts. This may be achieved by discharging the water quality control volume via infiltration. If the proposed SWM facility includes an infiltration component, pretreatment will be required to remove suspended sediment from the incoming stormwater. A hydrogeological assessment will be required prior to detailed to identify the maximum local groundwater elevations. If stormwater infiltration is proposed, the hydrogeological assessment will measure existing infiltration rates and establish the pond design infiltration volume.

Overflows from the upstream external drainage areas are conveyed around the perimeter of the proposed development by a proposed bypass swale. While the bypassed flows may be discharged to the existing overland flow route that conveys surface flows to the downstream CP Rail culvert. However, the proposed SWM design will need to provide sufficient documentation to demonstrate that the post-development discharges to not raise the risk of downstream flooding and/or erosion.

*West Komoka Development Area*

The following stormwater alternatives were developed to address the problem and opportunity statement relating to the West Komoka Development Area:

**Alternative 1**: Do Nothing

**Alternative 2**: Service Only Proposed Development

**Alternative 3**: Service Both Existing and Proposed Development

**Alternative 2** "Service Only Proposed Development" was selected as the **preferred alternative**.

The future land use identified in the Official Plan in this catchment area is Settlement Employment. Runoff from this future development is treated by two proposed SWM facilities.

SWM 1, located west of Komoka Creek, provides both water quality treatment and peak flow control to the proposed development runoff. The only available surface water outlet from this catchment is the existing small diameter CSP Glendon Drive culvert. The available soils information and the lack of a defined channel downstream of the culvert suggest that the site soils are extremely permeable. Consequently, SWM 1 will be designed primarily as an infiltration facility, with overflows directed to the existing Glendon Drive culvert. Additionally, future developments within the proposed SWM 1 service area should be designed with on-site infiltration measures to retain the runoff from small frequent storm events and infiltrate the captured runoff over a larger area.

SWM 2, located west of Komoka Creek, provides both water quality treatment and peak flow control to the proposed development runoff. The proposed pond will be designed as a dry facility. Since Komoka Creek supports a coldwater fishery, the proposed facility will mitigate potential temperature impacts by discharging the water quality control volume via infiltration. Runoff from more significant storm events will be attenuated in the facility and discharged to Komoka Creek via a proposed pipe outlet

Since the proposed SWM facilities include infiltration component, pretreatment will be required to remove suspended sediment from the incoming stormwater. A hydrogeological assessment will be completed prior to detailed design to measure soil permeability, identify the maximum local groundwater elevations, and establish the pond design infiltration volume. Industrial land uses should be avoided in this area, as current MECP guidance states that runoff from industrial sites should not be treated using infiltration measures due to the associated risk of groundwater contamination.

*Northeast Komoka Development Area*

The following stormwater alternatives were developed to address the problem and opportunity statement relating to the Northeast Komoka Development Area:

**Alternative 1**: Do Nothing

**Alternative 2**: SWM Facility with Surface Water Outlet to Oxbow Creek

**Alternative 3**: Two SWM Facilities

**Alternative 3** "Two SWM Facilities" was selected as the **preferred alternative**.

Runoff from future development in the Northeast Komoka Development Area will be treated by two proposed SWM facilities. Stormwater from the eastern portion of the catchment is treated by SWM 1, which provides water quality treatment and peak flow control prior to discharging to Oxbow Creek. The proposed pond will be designed as a dry facility to mitigate potential temperature impacts on Oxbow Creek. Pretreatment will be provided upstream of the facility to verify that the proposed SWM measures provide Enhanced Protection Level water quality treatment.

The western portion of this catchment is a former gravel pit that currently drains exclusively via infiltration and evaporation. Runoff from future development in this area will be treated by SWM 2, which will detain all runoff from the future residential development and release it via infiltration, similar to existing conditions. Pretreatment will be required to remove suspended sediment from the post-development runoff prior to discharging to SWM 2.

*Kilworth Glendon Drive Area*

The following stormwater alternatives were developed to address the problem and opportunity statement relating to the Kilworth Glendon Drive Area:

**Alternative 1**: Do Nothing

**Alternative 2**: Discharge to Oxbow Creek

**Alternative 3**: Discharge to Glendon Drive Storm Sewer

**Alternative 3** "Discharge to Glendon Drive Storm Sewer" was selected as the **preferred alternative**.

The proposed Glendon Drive streetscape improvements include a proposed trunk storm sewer to collect and convey minor flows from the proposed right-of-way westward to a future outlet. This proposed trunk storm sewer will provide the outlet from future development located north of Glendon Drive. Major flows the portion of the proposed Glendon Drive streetscape improvements located in this catchment are conveyed to Oxbow Creek by the existing overland drainage route.

A proposed regional SWM pond provides all necessary stormwater treatment to the runoff from future development located north of Glendon Drive. Minor flows are conveyed to SWM 1 by proposed local storm sewers and major flows are conveyed by the future right-of-ways. Given the local sandy soils, LID measures to capture and retain runoff near its source are likely a feasible strategy for reducing the peak minor system flows and the SWM1 design storage volumes.

The treated flows from SWM1 are discharged to a proposed storm sewer on Tunks Lane, that discharges to the future Glendon Drive trunk storm sewer. Given the recent development activity in the Tunks Lane Area, the Municipality should develop a plan to secure a drainage corridor from this catchment area to Tunks Lane to prevent obstruction of this drainage route by future development.

*Kilworth East*

The following stormwater alternatives were developed to address the problem and opportunity statement relating to the Kilworth East catchment:

**Alternative 1**: Do Nothing

**Alternative 2**: SWM Strategy per Glendon Drive EA

**Alternative 3**: Grassed Ditches to Provide Treatment

**Alternative 2** "SWM Strategy per Glendon Drive EA" was selected as the **preferred alternative**.

In accordance with the recommendations of the Glendon Drive Streetscape EA, all runoff from this portion of the Glendon Drive improvements is collected and treated by a proposed enhanced grass swale located on the north side of the Glendon Drive right-of-way. The proposed enhanced grassed swale will be designed in accordance with MECP guidelines to provide water quality treatment and will incorporate check dams to provide peak flow control. The proposed enhanced grassed swale will discharge to the Thames River.

Given the significant anticipated street and property impacts, replacement of the existing concrete lined ditches in the Kilworth Subdivision is not recommended at this time, though they should be maintained and repaired as needed. The Municipality could consider replacing driveway culverts that are prone to debris accumulation with improved inlets to reduce maintenance requirements.

*Melrose*

The following stormwater alternatives were developed to address the problem and opportunity statement relating to the Melrose Settlement Area:

**Alternative 1**: Do Nothing

**Alternative 2**: Relocate Drainage System

**Alternative 2** "Relocate Drainage System" was selected as the **preferred alternative**.

The existing municipal drains located in the residential rear yards are abandoned and replaced with rear yard catchbasins with leads that connect to the local storm sewers located in the municipal right-of-ways. The proposed leads will be located in proposed drainage easements offset from existing property lines to mitigate the risk of damage caused by future home improvements. Where feasible, trenchless installation should be considered to reduce construction disruption on affected homeowners.

The **preferred alternatives** are illustrated on Figures ES-1 through ES-11 appended to the Executive Summary.

**Capital Program Tables and Class EA Schedule Summary**

This Master Plan has been completed in accordance with Approach 2 under the MEA Class EA approach for Master Plans which satisfies Phase 1 and 2 of the planning process. Accordingly, this document provides information to support any future studies or investigations in relation to each of the preferred solutions identified within the Master Plan.

Projects identified as part of the Master Plan are outlined in Table E.1, along with their respective Class EA Schedule. In determining the proposed Class EA schedule for each project, recommendations are provided based on the anticipated magnitude of the preferred alternatives' environmental impact, input received by stakeholders as part of the consultation process, and guidance provided in Appendix 1 of the MEA Class EA document. For drainage areas where development may occur and stormwater works are required (i.e., SWM pond, OGS) on development lands subject to a *Planning Act* application such as a Draft Plan of Subdivision, works are noted as Schedule A activities as the SWM facilities and related appurtenances will be addressed as part of the *Planning Act*.

Upon completion of the Master Plan and subject to the 30-day review period (assuming no Part II Order requests are made for individual projects identified), Schedule A, A+, and B projects are pre-approved and may proceed to design and construction subject to approval by Council. During subsequent design and construction, proposed alignments and locations of infrastructure may be refined as necessary, but within the general context of the project as defined in this Master Plan. Site specific environmental investigations or mitigation measures identified within this Master Plan document shall also be incorporated into the detailed design and construction processes.

The Notice of Completion of this Master Plan is issued on the basis of the identification of the following projects and Class EA schedules.

### Table E.1-1 Projects, Class EA Schedule, and Estimated Costs

| Project/Drainage Area | Preferred Alternative | Municipal Class EA Schedule | Estimated Cost |
|---|---|---|---|
| Arva Development Area | Alternative 2 | Schedule A | $300,000 |
| Ballymote | Alternative 2 | Not applicable | $100,000 |
| Ilderton Drain No. 2 | Alternative 2 | Not applicable | $150,000 |
| South Ilderton Development Area | Alternative 3 | Schedule A | $5,350,000 |
| Komoka Drain No. 1 | Alternative 6 | Schedule B and Provincial Parks and Conservation Reserve EA and Infrastructure Ontario approval | $4,300,000 |
| Komoka Drain No. 3 | Alternative 2 | Schedule A | $1,300,000 |
| West Komoka Development Area | Alternative 2 | Schedule A | $4,800,000 |

| Project/Drainage Area | Preferred Alternative | Municipal Class EA Schedule | Estimated Cost |
|---|---|---|---|
| Northeast Komoka Development Area | Alternative 3 | Schedule A | $2,250,000 |
| Kilworth Glendon Drive Area | Alternative 3 | Schedule B | $2,500,000 |
| Kilworth East | Alternative 2 | Schedule A | $410,000 |
| Melrose | Alternative 2 | Schedule B | $350,000 |

Cost estimates are considered Class 4, and consistent with ASTME 2516-06 accuracy ranges are subject to +20% to +30%, and -10% to -20%. Cost estimates below include anticipated construction costs, contingency, and engineering costs at a percentage of construction, which provides an allowance for typical permits and site investigations (geotechnical and hydrogeological).

**Figures ES-1 through ES-11 Preferred Alternatives**

# Abbreviations

| | |
|---|---|
| COSEWIC | Committee on the Status of Endangered Wildlife in Canada |
| COSSARO | Committee on the Status of Species at Risk in Ontario |
| CWA | *Clean Water Act* |
| CSP | Corrugated Steel Pipe |
| DAR | Development Assessment Report |
| DFO | Department of Fisheries and Oceans |
| EA | Environmental Assessment |
| EA Act | *Environmental Assessment Act* |
| ECA | Environmental Compliance Approval |
| ESA | *Endangered Species Act* |
| END | Endangered |
| HADD | Harmful alteration, death or destruction |
| HVA | Highly Vulnerable Aquifer |
| LID | Low Impact Development |
| MBCA | *Migratory Birds Conservation Act* |
| MEA | Municipal Engineers Association |

| | |
|---|---|
| MECP | Ministry of Environment, Conservation and Parks |
| MOMC | Municipality of Middlesex Centre |
| MNRF | Ministry of Natural Resources and Forestry |
| MP | Master Plan |
| MSTC | Ministry of Tourism, Culture and Sport |
| NHIC | Natural Heritage Information Centre |
| OP | Official Plan |
| PDC | Private Drain Connection |
| PIC | Public Information Centre |
| PPS | Provincial Policy Statement |
| RMO | Risk Management Official |
| SAR | Species at Risk |
| SARA | *Species at Risk Act* |
| SARO | Species at Risk in Ontario |
| SC | Special Concern |
| SGRA | Significant Groundwater Recharge Areas |
| SWM | Storm Water Management |

| | |
|---|---|
| SWMF | Storm Water Management Facility |
| SPA | Source Protection Area |
| SPP | Source Protection Policies |
| SWP | Source Water Protection |
| THR | Threatened |
| TSS | Total Suspended Solids |
| TSSPR | Thames-Sydenham Source Protection Region |
| UTRCA | Upper Thames River Conservation Authority |
| WHPA | Wellhead Protection Area |
| WWTP | Wastewater Treatment Plant |

# Glossary

| | |
|---|---|
| **Conveyance** | The movement of stormwater by means of storm sewers, ditches, swales, roads, etc. |
| **Dry Pond** | A stormwater management technique which involves a detention basin to retain runoff during significant periods of wet weather, but which does not maintain a permanent body of standing water. This technique effectively mitigates erosion and provides flood control. |
| **End-of-Pipe SWM Controls** | Multi-purpose stormwater management facilities (SWMFs) which address objectives relating to water quality, erosion control and peak flow control. SWMFs include wet/dry ponds, wetlands, oil/grit separators, etc. |
| **Lot-level/Onsite SWM Controls** | Measures that address stormwater before it leaves a site and enters the storm sewer system. These controls can include reduced lot grading, redirection of downspouts, low-impact development infrastructure (ex. porous concrete) and other site-design considerations. |
| **Major System** | The storm drainage system in which water will flow in a major storm, when the capacity of the minor system is exceeded. The major system includes many features such as streets, curb and gutter systems, swales and major drainage channels. Design of a major system is based on the 100-year storm event frequency. |
| **Minor System** | The storm drainage system which is designed to eliminate or minimize inconvenience or disruption of activity as a result of runoff from the more frequent, less intense storms. The minor system usually includes street gutters, storm sewers and catchbasins. Design of a minor system is based on a storm frequency of 1 in 2 years. |
| **Municipal Drain** | Storm drainage systems which were typically constructed to service rural or agricultural lands but may be present within existing residential areas. Under Ontario's *Drainage Act*, funding for the |

| | |
|---|---|
| | maintenance of Municipal Drains is provided by the benefitting property owners. |
| **Outlet/Outfall** | The points at which stormwater discharges from a storm sewer or other conveyance system, usually into a creek, stream, river or other waterbody. |
| **Overflow** | Unintentional discharge of stormwater to a waterbody caused by runoff volumes which are larger than the system was designed for. |
| **Road Right of Way (ROW)/Cross Section** | The configuration of the roadway. Urban ROWs typically include curb and storm sewers, whereas rural ROWs contain roadside ditches. Semi-urban ROWs may contain ditches and/or storm sewers, but generally exclude curbs. |
| **Storm Drainage System** | A system for receiving, conveying and controlling discharges in response to precipitation and snowmelt. Systems consist of ditches, culverts, swales, roadways, curbs and gutters, catchbasins, manholes, pipes, detention ponds, etc. |
| **Stormwater** | Rain, melted snow, or any other form of precipitation that has encounter the ground or any other surface. This water seeps into the ground, is absorbed by vegetation, evaporates or runs off the land into storm sewers, streams or lakes. |
| **Stormwater Management (SWM)** | The management of precipitation as it interacts with municipal infrastructure (roads and stormdrains) before ultimately being absorbed into the soil or discharged to a receiving water body. |
| **Wet Pond** | A stormwater management technique which involves a detention basin to retain runoff during significant periods of wet weather, and which maintains a permanent body of standing water. This technique provides water treatment, erosion control and flood mitigation. |

# 1.0 INTRODUCTION AND STUDY BACKGROUND

## 1.1 BACKGROUND

The Municipality of Middlesex Centre (the Municipality), through its consultant Stantec Consulting Ltd. (Stantec) has completed the Middlesex Centre Settllement Area Stormwater Master Plan.

Development throughout Middlesex Centre has historically been piecemealed and has led to a fragmented stormwater management system that is made up of a combination of municipal drains and municipal storm sewers. In order to develop a plan for effectively managing stormwater infrastructure for existing areas and to accommodate future growth, the Municipality has developed this Stormwater Master Plan.

This Master Plan was completed in accordance with the Ontario *Environmental Assessment Act* and followed Approach # 2 of the Municipal Engineers Association (MEA) Master Planning Process found within the Municipal Class Environmental Assessment (2000, as amended). Refer to **Section 1.4.3** for a detailed description of the Master Planning Process.

## 1.2 STUDY PURPOSE AND OBJECTIVES

The Master Plan (MP) is being undertaken to in order to develop a holistic approach to managing stormwater infrastructure throughout the Municipality, which includes both existing developed areas and future development areas.

The scope of work being completed as part of this Master Plan includes:

- Background review and identification of key issues;
- Environmental reviews and characterization of the study area;
- Technical review of existing drainage conditions and catchment areas;
- Identification and evaluation of alternatives based on a set of criteria that address key issues, as well as the social, natural, technical, and economic environmental factors;
- Development of a Stormwater Management Master Plan to outline a drainage servicing strategy based on the preferred alternatives;
- Public, Indigenous community, agency, and stakeholder consultation; and
- Preparation and Filing of a Master Plan document.

The objective of the MP is to identify necessary stormwater drainage system improvements to better service the existing community, and to provide a stormwater servicing strategy to accommodate future growth and development. The MP will identify the stormwater infrastructure required to mitigate the possibility of flooding and erosion, provide adequate stormwater treatment, and protect against impacts to the downstream receiving water systems. The MP will contain the stormwater servicing strategy that best balances the following responsibilities:

- Provides adequate drainage servicing and stormwater treatment for existing and future development areas;
- Protects the natural environment;
- Reduces negative impacts on affected properties; and
- Minimizes stormwater servicing costs.

## 1.3 STUDY AREAS

The overall study area includes 10 Settlement Areas within the Municipality of Middlesex Centre, which is a lower tier municipality within Middlesex County. These 10 Settlement Areas include Arva, Ballymote, Birr, Bryanston, Denfield, Ilderton, Komoka, Kilworth, Lobo and Melrose. Based on existing storm drainage infrastructure (e.g., municipal drains and/or municipal storm sewers), some of the Settlement Areas were further broken down into catchment areas, which are further described below.

The Arva Settlement Area is comprised of two significant storm drainage catchment areas: the Arva Built-Up Area and the Arva Development Area. The Arva Built-Up Area is mainly comprised of residential neighbourhoods, commercial/retail, institutional (Medway Highschool), places of worship (St. John the Divine Anglican Church) generally along Medway Road. The Arva development area generally consists of agricultural lands and existing development along the west side of Highway 4.

The Ballymote Settlement Area is centered on the intersection of Medway Road and Highbury Avenue North. The Settlement Area is mainly comprised of residential lands with a few commercial areas. Undeveloped land within the Settlement Area boundary currently consists of agricultural uses.

The Birr Settlement Area is mainly comprised of residential lands, a commercial area, Birr United Church Cemetery and the Birr Anglican Cemetery. A small area of undeveloped land within the Settlement Area boundary currently consists of agricultural uses.

The Bryanston Settlement Area is generally centered on Twelve Mile Road/Plover Mills Road and Highbury Avenue North and is mainly comprised of residential, a few commercial areas and institutional areas (e.g., Bryanston Fire Station and Community Centre). Additional residential lots have been developed adjacent to the Settlement Area boundary.

The Denfield Settlement Area extends along Denfield Road from Denfield Park in the north to Fifteen Mile Road in the south. The Settlement Area is mainly comprised of residential lands, open space (e.g., Denfield Park), and the Denfield-Welsh cemetery. A strip of undeveloped land along Denfield Road currently consists of agricultural uses.

Ilderton is one of two Urban Settlement Areas within the Municipality. It is generally comprised of residential lands, open space (e.g., parks, soccer fields), industrial (e.g., fire hall, wastewater treatment plant), and institutional (library, medical centre). There are several areas of undeveloped lands within th Settlement Area boundary designated for future residential and employment lands and currently consist of agricultural uses and woodlots.

Komoka-Kilworth is the second of two Urban Settlement Areas within the Municipality. Komoka generally consists of residential lands, institutional (school, healthcare centre, museum), commercial/retail, places of worship, open space (e.g., Komoka Park and old gravel pits) and industrial (e.g., Komoka Machine).

The Kilworth Settlement Area is generally comprised of undeveloped future residential lands, existing residential neighbourhoods, commercial/retail, and open space (e.g., Optimist Park-Kilworth).

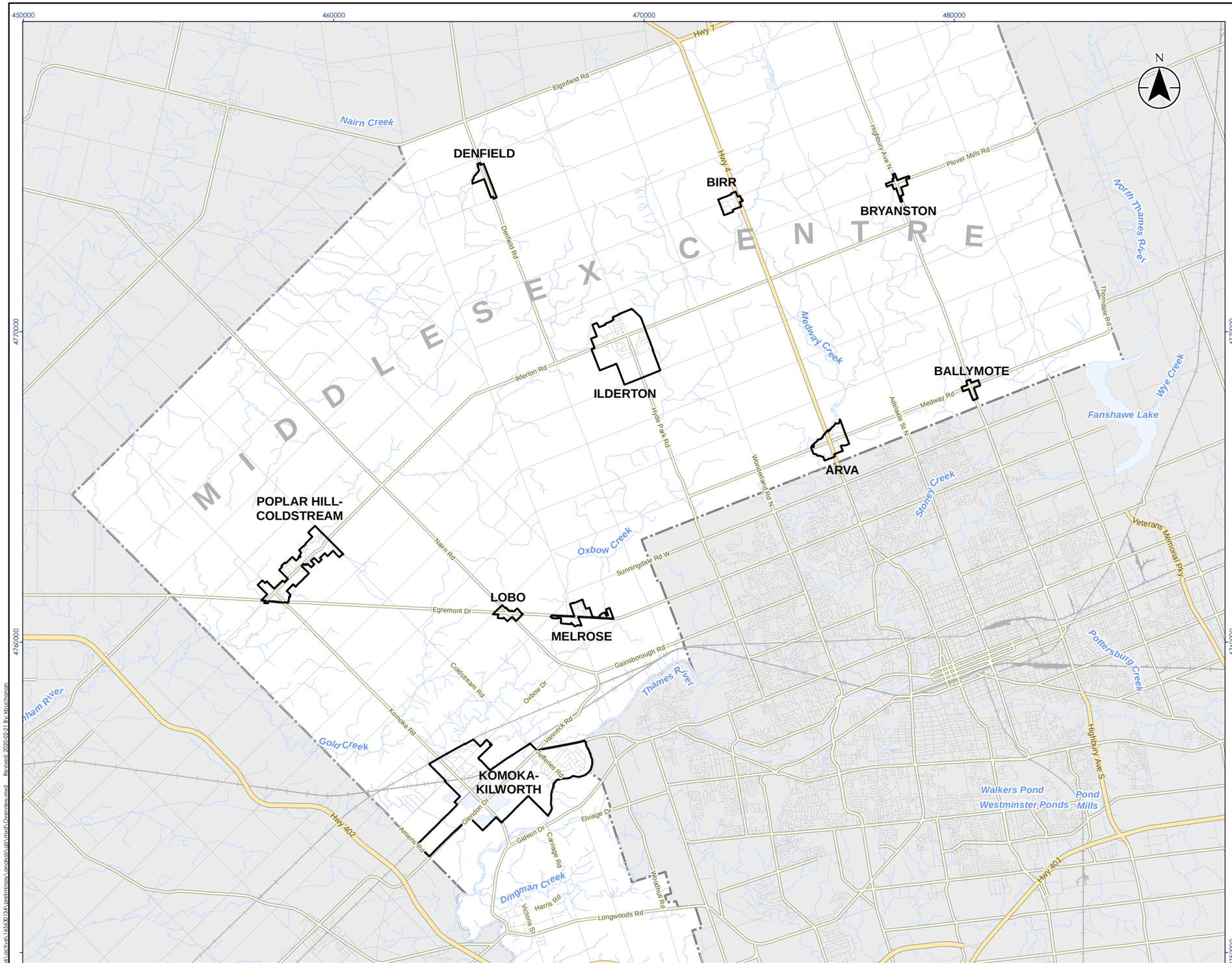
The Lobo Settlement Area is centered on Egremont Drive and Nairn Road. The Settlement Area generally consists of single-family residential lots with a few commercial/retail and agricultural establishments. It also includes a place of worship. The development areas are comprised of agricultural lands.

The Melrose Settlement Area is generally comprised of single-family residential lots with a few commercial/retail establishments. The development area is comprised of agricultural lands.

The Poplar Hill-Coldstream Settlement Area was two smaller communities, but due to their close proximity was merged into one Settlement Area. The Settlement Area is generally comprised of residential neighbourhoods, places of worship (e.g., Church off 22, Poplar Hill Baptist Church), commercial/retail establishments, institutional (e.g., Valleyview Elementary School). The development areas are comprised of agricultural lands.

Note that Delaware has not been included within this study, since a Stormwater Master Plan has recently been completed for the Settlement Area (Stantec, 2016).

Figure 1.3.1 illustrates the Settlement Areas which comprise the study area.




Stantec

Legend

Study Settlement Area

0 2 4 Kilometers

1:125,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Contains information licensed under the Open Government Licence – Ontario.

Project Location
Municipality of Middlesex

165630134 REVA
Prepared by KDB on 2020-02-21

Client/Project
MUNICIPALITY OF MIDDLESEX CENTRE
SETTLEMENT AREAS STORM WATER MASTER PLAN
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

Figure No.
1.3.1

Title
**Existing Settlement Areas**

# 1.4 MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT PROCESS

## 1.4.1 Overview

All municipalities in Ontario are subject to the provisions of the *Environmental Assessment Act* (*EA Act*) and its requirement to prepare an Environmental Assessment (EA) for applicable public works projects. The Ontario Municipal Engineers Association (MEA) "Municipal Class Environmental Assessment" document (October 2000 as amended in 2007, 2011, and 2015) provides municipalities with a five-phase planning procedure approved under the *EA Act* to plan and undertake all municipal infrastructure projects in a manner that protects the environment as defined in the *Act*.

Key components of the EA planning process include:

- Consultation with potentially interested parties early and throughout the process;
- Consideration for a reasonable range of alternative solutions;
- Systematic evaluation of alternatives;
- Clear and transparent documentation; and
- Traceable decision-making.

Figure 1.4.1 illustrates the process followed in the planning and design of projects covered by a Municipal Class EA. The figure incorporates steps considered essential for compliance with the requirements of the *EA Act* discussed below.

- **Phase 1** - Identify the problem (deficiency) or opportunity, which may include public consultation to confirm/review the problem or opportunity.
- **Phase 2** - Identify a reasonable range of alternative solutions to address the problem or opportunity. This Phase also includes an inventory of the existing environment in order to identify potential mitigation measures, and to assist in the evaluation of alternatives in terms of the identified evaluation criteria. A preferred solution is chosen based on the results of the evaluation and considers input from the public, review agencies, and Aboriginal Communities. It is at this point that the appropriate Schedule (B or C) is chosen for the undertaking. If Schedule B is chosen, the process and decisions are then documented in a Project File. Schedule C projects proceed through the following additional phases.
- **Phase 3** (Schedule C projects only) - Examine the alternative methods for implementing the preferred solution, which typically involve design alternatives. A detailed inventory of the natural, social, economic, and technical environments are undertaken in order to assess the impacts of the alternative designs, in an attempt to minimize negative effects and maximize positive effects.
- **Phase 4** (Schedule C projects only) - Document the Class EA Process followed in an Environmental Study Report (ESR), which includes a summary of the rationale and the planning,

design, and consultation process followed for the project and make the documentation available for consideration by the public, review agencies, Aboriginal Communities, and the public through a mandatory 30-day review period.

- **Phase 5 -** Complete contract drawings and documents and proceed to construction and operation with monitoring to ensure adherence to environmental provisions and commitments.

The Municipal Class EA process and associated documentation serves as a public statement of the decision-making process followed by municipalities for the planning and implementation of necessary infrastructure.

### 1.4.2 Project Planning Schedules

The MEA Class EA document provides a framework by which projects are classified as Schedule A, A+, B, or C. Classification of a project is based on a variety of factors including the general complexity of the project and level of investigation required, and the potential impacts on the natural and social environment that may occur. It is the responsibility of the proponent to identify the appropriate schedule for a given project, and to review the applicability of the chosen schedule at various stages throughout the project. Each of the schedules requires a different level of documentation and review to satisfy the requirements of the Class EA, and thus comply with the *EA Act* as noted below.

**Schedule A** projects are limited in scale, have minimal adverse impacts on the natural and social environments, and include the majority of municipal sewage, stormwater management, water operations, and maintenance activities. These projects are pre-approved and may be implemented without following the procedures outlined in the Class EA planning process. Examples of Schedule A projects include watermain and sewer extensions where all such facilities are located within the municipal road allowance or an existing utility corridor. As such, these projects are pre-approved and subsequently do not require any further planning and public consultation.

**Schedule A+** projects are similarly pre-approved under the Municipal Class EA but require that potentially affected parties be notified prior to implementation. The public has a right to comment to municipal officials or their council on the project; however, considering that the projects are pre-approved, there is no appeal process to the Minister of the Environment, Conservation and Parks on these projects (Part II Order Requests as discussed in **Section 1.4.4**). It should be noted that amendments to the *EA Act* enacted through Bill 108 exempt Schedule A and A+ projects from the requirements of the *EA Act.*

**Schedule B** projects have the potential for some adverse environmental and social effects. The proponent is required to undertake a screening process involving mandatory contact with potentially affected members of the public, Aboriginal Communities, and relevant review agencies to ensure that they are aware of the project and that their concerns are addressed.

Schedule B projects require that Phases 1 and 2 of the Municipal Class EA planning process be followed and a Project File report be prepared and filed for a mandatory 30-day review by the public, agencies, and Aboriginal Communities. If all comments or concerns received within this 30-day review period can be addressed, the proponent may proceed to project implementation (Phase 5). If concerns are raised

that cannot be resolved, then the Part II Order procedure may be invoked. Projects generally include watermain and sewer extensions where all such facilities are located outside of the municipal road allowance or an existing utility corridor.

**Schedule C** projects have the potential for significant environmental impacts and must follow the full planning and documentation procedures specified in the Class EA document (Phases 1 to 4). An Environmental Study Report (ESR) must be prepared and filed for review by the public, review agencies and Aboriginal Communities. If concerns are raised that cannot be resolved, then the Part II Order procedure may be invoked. Projects generally include the construction of new facilities and major expansions to existing facilities.

### 1.4.3 Class EA Master Plan Approach

The stormwater servicing strategy is being undertaken in accordance with the Master Plan requirements found within the MEA Municipal Class EA document. This approach was developed to recognize the benefits of considering a group of related projects, or an overall system – in this case stormwater management – prior to addressing individual projects or areas.

Master Plans are long-range plans undertaken to create a framework for future projects that form part of an integrated system. The projects identified within Master Plans are typically distributed geographically throughout the study area, and are intended to be implemented over an extended period of time based on project triggers including required maintenance, available funding, etc.

The scope and complexity of Master Plans varies significantly. The MEA document emphasizes the need to customize the planning process to fit the needs of the undertaking and offers four general approaches that address Master Plans of varying complexity.

This Master Plan is following Approach 2, which involves the completion of a Master Plan document at the conclusion of Phases 1 and 2, fulfilling the requirements for Schedule B projects. Any project identified within the Master Plan as a Schedule C undertaking would be subject to the completion of Phases 3 and 4, including the preparation and filing of an ESR for public review prior to implementation. A list of projects, including their project schedules and further study requirements is included in **Section 8.1.**

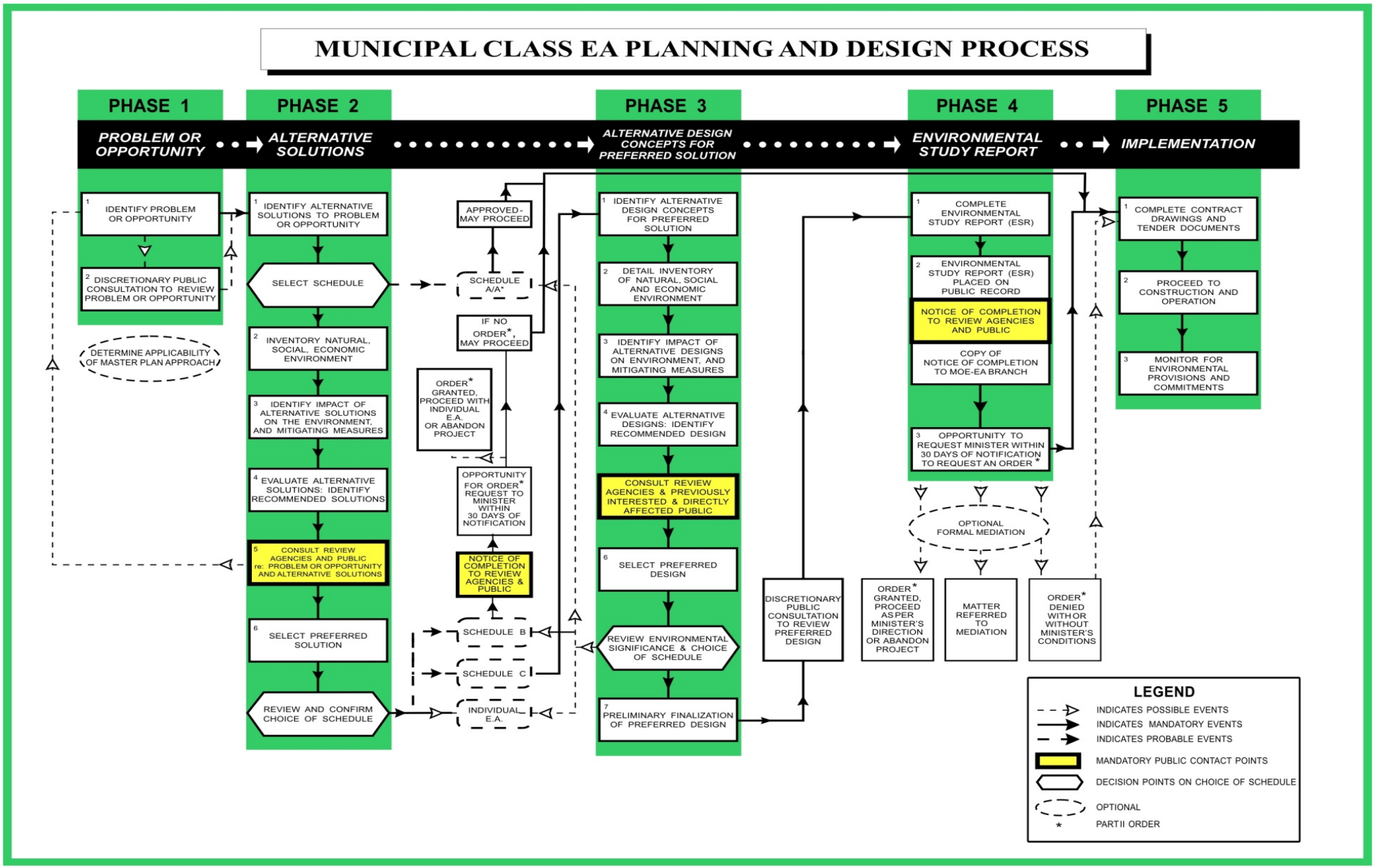



**Figure 1.4.1 Municipal Class EA Process**

### 1.4.4 Part II Order Requests

If significant outstanding issues have not been addressed during the Class EA study process and could be better addressed through an Individual EA process, any member of the public can ask for a higher level of assessment. This is known as a Part II Order and anyone can make the request. A Part II Order request should not be submitted to delay or stop the planning and implementation of a Class EA project.

As per the MEA Class EA, Master Plans themselves are not subject to Part II Orders, only the Schedule B and C projects identified within them.

A Part II Order request can be made within the specified review period as outlined in the Notice of Completion. A Part II Order request is submitted only when issues cannot be resolved through the Class EA process, discussions with the proponent or with mediation.

As of July 1, 2018, a Part II Order Request Form must be submitted to request a Part II Order. To submit your Part II Order Request, you need to do the following:

1. Download the Part II Order Request Form
2. Complete the form and include the following information:
    - name and address
    - project name
    - proponent name
    - Specific reasons why the request is being made - concerns and issues
    - Why a higher level of environmental assessment would address your concerns
    - Information about efforts to date to discuss and resolve concerns with the proponent
    - The outcome you are seeking from the minister
    - Other matters relevant to the request

The request must focus on potential environmental effects of the project or the Class EA process; not focus on decisions outside the Class EA process (e.g., land-use planning decisions made under the *Planning Act* or issues related to municipal decision-making about the process); and not raise issues unrelated to the project. Unless stated otherwise in the request, any personal information provided will become part of the public record and will be released, if requested, to any person.

The completed Part II Order Request Form must be submitted to the Minister of Environment, Conservation and Parks or delegate, with a copy of the form to the Director of Environmental Assessment and Permissions Branch and the City:

Minister
Ministry of the Environment, Conservation and Parks
Floor 11
77 Wellesley Street West
Toronto ON M7A 2T5
Minister.mecp@ontario.ca

Director, Environmental Assessment and Permissions Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto ON M4V 1P5
enviropermissions@ontario.ca

Minister's decisions on Part II Order requests are final. The minister has 4 options for a decision on a Part II Order request:

1. refer the matter to mediation before making a decision;
2. deny the request and inform the proponent and requester;
3. deny the request but impose conditions; or
4. require the proponent to comply with the Part II Order and prepare a terms of reference and individual environmental assessment.

If the request has been turned down, the City can implement the project subject to any conditions imposed. If the request has been granted, the City can begin preparing terms of reference for an Individual EA, if they still wish to move ahead with the project.

## 1.5 COMMUNICATIONS AND CONSULTATION OVERVIEW

As part of the Master Planning Process, several steps have been undertaken to inform review agencies, affected landowners, the local communities, general public and First Nations Communities of the project and to solicit input. A stakeholder contact list was developed and maintained throughout the study, which included relevant provincial and federal agencies, local agencies, and interested members of the public (see Appendix A.5). More information on the input received throughout the project is provided in Section 7 below.The following table provides an overview of the main points of contact with stakeholders throughout the project.

## Table 1-1 Points of Contact

| Point of Contact | Date and Method of Distribution |
|---|---|
| Notice of Commencement | Published in Middlesex Banner Newspaper – February 2018<br>Published in Londoner Newspaper – February 2018<br>Published on the Municipality of Middlesex Centre Website – February 2018<br>Sent via mail to stakeholder list on February 23, 2018<br>Provided to all Settlement Area residents as an insert within their stormwater management bill |
| Notice of Public Information Centre # 1<br>Monday May 7, 2018 – Komoka Wellness and Recreation Centre<br>Tuesday May 8, 2018 – Ilderton Community Centre<br>Thursday May 10, 2018 – Bryanston Community Centre | Published in Middlesex Banner Newspaper – April 25, 2018<br>Published in Londoner Newspaper – April 26 and May 3, 2018<br>Published on the Municipality of Middlesex Centre Website – starting April 20, 2018<br>Provided to all Settlement Area residents as an insert within their stormwater management bill for the month of April |
| Notice of Public Information Centre # 2<br>Monday March 4, 2019 – Komoka Wellness and Recreation Centre<br>Tuesday March 5, 2019 – Ilderton Community Centre<br>Wednesday March 6, 2019 – Bryanston Community Centre | Published in Middlesex Banner Newspaper – February 13, 2019<br>Published in Londoner Newspaper – February 21 and February 28, 2019<br>Published on the Municipality of Middlesex Centre Website – Starting February 1, 2019<br>Mailed to stakeholders starting February 13, 2019.<br>Provided to all Settlement Area residents as an insert within their stormwater management bill |
| Notice of Completion<br>Public Review Period – August 27, 2020- October 1, 2020 | Published in Middlesex Banner Newspaper – August 26, 2020 and September 9, 2020<br>Published in Londoner Newspaper – August 27, 2020 and September 3, 2020<br>Published on the Municipality of Middlesex Centre Website – August 20, 2020 |

# 2.0 PHASE 1: PROBLEM/OPPORTUNITY STATEMENT

## 2.1 PROBLEM/OPPORTUNITY STATEMENT

The first step in the Class EA process is to identify the problem or opportunity that has led to the undertaking of the Master Plan. The Problem and Opportunity statement for the Middlesex Centre Settlement Area Stormwater Master Plan is as follows:

*The Master Plan shall assess the existing drainage conditions throughout the Settlement Areas and develop an environmentally sound and sustainable strategy for addressing existing issues and accommodating future growth. The objective is to develop a Master Plan for the identified Settlement Areas that balances the following responsibilities:*

- *Reduce negative impacts of flooding on properties;*
- *Provide adequate stormwater treatment;*
- *Minimize stormwater servicing costs; and*
- *Protect the natural environment.*

It is noted that while properly functioning storm drainage infrastructure is crucial in protecting property from flood damage and may help mitigate lot-level drainage issues, this Master Plan does not specifically address certain lot-level concerns such as high groundwater (i.e. sump pumps running continually).

# 3.0 PHASE 2 EXISTING CONDITIONS

Phase 2 of the Master Plan includes a review of existing conditions throughout the study area. This includes the existing planning policy framework and socio-economic environment, natural and cultural heritage environments, and existing drainage conditions.

## 3.1 PLANNING POLICY AND MUNICIPAL GUIDELINES/STANDARDS REVIEW

Below is a summary of relevant planning and policy documents that have been considered throughout the development and evaluation of alternative solutions.

### 3.1.1 Provincial Policy Statement

The 2014 *Provincial Policy Statement* (PPS) is a complimentary policy document to the *Planning Act* (2005), issued under Section 3 of the *Act*, and sets a policy foundation for regulating the and use of land. It came into effect on April 30, 2014 and replaces the 2005 *Provincial Policy Statement*. The PPS provides direction on matters of provincial interest and supports the enhancement of the quality of life for all citizens of Ontario. Consistency with the PPS shall be considered during the development and evaluation of alternative solutions. Key policies relevant to this master plan include the following:

- Infrastructure and Public Service Facilities (PPS Section 1.6);
- Natural Heritage (PPS Section 2.1);
- Water (PPS Section 2.2);
- Agriculture (PPS Section 2.3);
- Cultural Heritage and Archaeology (PPS Section 2.6); and
- Protecting Public Health and Safety (PPS Section 3).

The preferred alternatives and supporting recommendations will meet the objectives of the PPS by providing for infrastructure that is appropriate to address lands designated for future development within identified settlement areas, protects the natural environment and protects public health and safety.

### 3.1.2 Ontario's Climate Change Action Plan

The Climate Change Action Plan 2016-2020 is a plan that describes how climate change will be addressed to 2020. The plan also notes that climate change has damaged the environment and has caused extreme weather events such as flooding and drought. This extreme weather has damaged and destroyed infrastructure. The Plan highlights six key action areas that include transportation; building and

homes; land use planning; industry and business; collaboration with Indigenous Communities; and research and development.

Under the *Environmental Assessment Act,* proponents are required to have consideration for climate change and its effects. This Master Plan will consider climate change adaptation by identifying infrastructure improvements to help minimize the impacts of flooding and erosion. The design of stormwater infrastructure will have regard for the most update to date Intensity-Duration-Frequency curves available.

### 3.1.3 County of Middlesex Official Plan

The Municipality of Middlesex Centre is a lower-tier municipality within Middlesex County. The Middlesex County Official Plan provides a broad policy framework and deals with issues of Provincial and County wide interest, with which local municipal Official Plans must conform.

The County of Middlesex is currently undertaking a five-year review of their Official Plan. The current Official Plan outlines policies for Growth Management which recognizes the need to provide some growth in each local municipality. A hierarchy has been established to provide environmentally responsible growth to avoid conflict with natural features and hazards and the agricultural community. The majority of growth shall be directed to the designated Settlement Areas. Community Areas (such as Arva, Ilderton, Komoka, Kilworth) shall demonstrate the potential to accommodate future growth through population projections, must currently serve a community function and must demonstrate the potential to provide a level of service necessary to support future growth through a master servicing component of a Settlement Capability Report and/or completion of an Environmental Assessment. The goal of the Official Plan is that future development within Settlement Areas proceed on the basis of full municipal services. Partial services may be permitted on an interim basis where proper justification is provided.

The Middlesex County Official Plan states that local official plans shall encourage stormwater management practices that minimize stormwater volumes and contaminant loads.

This Master Plan will support the policies of the Middlesex County Official Plan by supporting the identification of municipal servicing within the designated settlement areas to support future growth and development.

### 3.1.4 Municipality of Middlesex Centre Official Plan

The Municipality of Middlesex Centre Official Plan (OP) was approved on April 19, 2000 with the latest amendments being adopted by the Municipality of Middlesex and approved by the County of Middlesex on July 24, 2018.

The Official Plan Land Use Schedules represent an important consideration of the Master Plan. Land use designations within each designated Settlement Area were reviewed to identify areas of future development and the nature of future development. It should be noted that this Master Plan has regard for existing Settlement Areas as delineated within the current Municipality of Middlesex Centre Official Plan. Any future Settlement Area boundary modifications shall consider infrastructure servicing

requirements through the Comprehensive Official Plan Review process as per the Provincial Policy Statement (2014).

Refer to Appendix C for the OP Schedules described below.

#### 3.1.4.1 Schedule A-1: Ilderton Urban Settlement Area

The Ilderton urban Settlement Area is primarily designated as Residential with pockets of Parks and Recreation. There are also larger areas in the southern part of the Settlement Area identified as Settlement Employment (Strategic Employment Area). The lands surrounding the Settlement Area are designated as Agriculture.

Special Policy Area # 1 is within this Settlement Area. The OP states that notwithstanding the residential designation, lands within SPA #1 may also be used for commercial uses provided they are designed and integrated that is compatible with adjacent residential uses. The area near the north and east boundary of SPA #1 should be developed to be predominately residential in nature.

#### 3.1.4.2 Schedule A-2: Komoka-Kilworth Urban Settlement Area & Secondary Plan

The Komoka-Kilworth urban Settlement Area is primarily designated as Residential with areas of Parks and Recreation and Natural Environment. Schedule A-2 also identifies existing and conceptual locations of stormwater management ponds within the Settlement Area. There is also an area at the southeast corner of Komoka Road and Glendon Drive which has been identified as being deferred via Official Plan Amendment (OPA) 28. These lands are not considered within the existing Settlement Area boundaries, as no specific land use designations have been identified. The completion of a number of detailed environmental studies are required prior to development.

#### 3.1.4.3 Schedule A-3: Arva Community Settlement Area

The Arva community Settlement Area is primarily designated as Residential and Village Centre around the intersection of Medway Road/County Road 28 and Richmond Street/Highway 4. There is also a small pocket of Settlement Commercial. The lands surrounding the Settlement Area are designated as Agriculture, Parks and Recreation and Floodplain. SPA #19 is outside of the Settlement Area, south of Croydon Drive. Prior to the development of lands within SPA #19, a Development Assessment Report should be prepared, an archeological assessment completed, and a site plan agreement be approved.

#### 3.1.4.4 Schedule A-5: Ballymote Hamlet Area

The Ballymote Settlement Area, centered on the intersection of Medway Road/County Road 28 and Highbury Avenue North/County Road 23 is designated as Hamlet and is surrounded by Agriculture. Within the Official Plan, Hamlet areas are intended to serve as local service centres for the surrounding agricultural land uses. While expansion of Hamlet areas is not anticipated within the planning horizon for the Official Plan, infill development within the Hamlets may be considered (Official Plan 1.8.d). Lands within the Hamlet areas have not been separated into separate land uses, but general include residential

uses, commercial, or industrial uses of a scale that is compatible with the surrounding land uses, institutional, and parks and recreation uses.

#### 3.1.4.5 Schedule A-6: Birr Hamlet Area

The Birr Settlement Area is all designated as Hamlet and is surrounded by Agriculture. Consistent with the other Hamlet areas, land uses may include residential, commercial, or industrial uses of a scale that is compatible with the surrounding land uses, institutional, and parks and recreation uses.

#### 3.1.4.6 Schedule A-7: Bryanston Hamlet Area

The Bryanston Settlement Area, centered on the intersection of Plover Mills Road/County Road 16 and Highbury Avenue North/County Road 23 is designated as Hamlet and is surrounded by Agriculture. Consistent with the other Hamlet areas, land uses may include residential, commercial, or industrial uses of a scale that is compatible with the surrounding land uses, institutional, and parks and recreation uses.

#### 3.1.4.7 Schedule A-8: Poplar Hill & Coldstream Hamlet Area

The Poplar Hill & Coldstream Settlement Area is primarily designated as Hamlet with small pockets of Natural Environment, Floodplain and Parks and Recreation. There are also areas of Aggregate Overlay. SPA #21 is located on the northeast corner adjacent to the Settlement Area. These lands are designated as Agriculture and permitted uses shall include a concrete batching plant and ancillary uses, which are further defined in the Municipality's Zoning Bylaw. Consistent with the other Hamlet areas, remaining uses in the Hamlet may include residential, commercial, or industrial uses of a scale that is compatible with the surrounding land uses, institutional, and parks and recreation uses.

#### 3.1.4.8 Schedule A-9: Denfield Hamlet Area

The Denfield Settlement Area is designated as Hamlet, surrounded to the north and northwest by Agriculture and Floodplain. There is an area of aggregate overlay south west of the Settlement Area. Consistent with the other Hamlet areas, land uses may include residential, commercial, or industrial uses of a scale that is compatible with the surrounding land uses, institutional, and parks and recreation uses.

#### 3.1.4.9 Schedule A-10: Lobo Hamlet Area

The Lobo Settlement Area is centered around Egremont Drive/County Road 22 and Nairn Road/County Road 17 and is designated as Hamlet. The lands surrounding the Settlement Area are designated as Agriculture. Consistent with the other Hamlet areas, land uses may include residential, commercial, or industrial uses of a scale that is compatible with the surrounding land uses, institutional, and parks and recreation uses.

#### 3.1.4.10 Schedule A-11: Melrose Hamlet Area

The Melrose Settlement Area is all designated as Hamlet. Lands located northeast of the Settlement Area are designated as Parks and Recreation and the remaining lands surrounding the Settlement Area

are designated Agriculture. Consistent with the other Hamlet areas, land uses may include residential, commercial, or industrial uses of a scale that is compatible with the surrounding land uses, institutional, and parks and recreation uses.

#### 3.1.4.11 Section 9.3 Municipal Infrastructure and Services Policies

Section 9.3.1 of the OP outlines Municipal Infrastructure and Services Policies for Settlement Areas and states that:

- The Municipality will undertake the preparation of Stormwater Management Studies in Settlement Areas, where deemed appropriate and necessary.

The Master Plan will support the policies of the Official Plan by identifying strategies for stormwater servicing to address existing and future development within the settlement area boundaries.

### 3.1.5 Middlesex Centre Urban Design Guidelines

The Municipality of Middlesex Centre's Settlement Area Urban Design Guidelines provide direction for new development in the Municipality and are to be considered when infill, subdivision, employment, institutional and commercial development is proposed.

For the purpose of this study, Section 4.8 of the Guidelines provides direction for Landscape Treatment of Stormwater Management Ponds associated with new residential neighbourhoods and non-residential development in Settlement Areas which are intended to support a naturalized appearance that will blend them into the landscape. Wet ponds are preferred. The following are basic principles for the landscape design treatment of stormwater management facilities:

- SWM areas will be designed as open, aesthetic amenities, allowing for accessibility and for enhancing the visual quality of the natural landscape;
- Trees, shrubs and grasses will be native and thrive in wetland, marsh and flood fringe areas;
- Walkways or boardwalks will be constructed to allow users to observe the marsh area;
- Where erosion control measures are required, the soft technique of bioengineering will be employed; and
- SWM areas will be integrated with natural heritage features, where possible.

Design and construction of SWM works recommended within this Master Plan shall have regard for the Municipality's Urban Design Guidelines.

### 3.1.6 Municipality of Middlesex Centre Site Plan Manual

The Municipality has prepared a Site Plan Manual to ensure that development proposals are in keeping with municipal policies, by-laws, guidelines and standards. Site Plan approval allows the Municipality and other agencies to review the overall site design, impacts to surrounding lands, widening of roads, grading and site drainage and more. The design and construction of stormwater works associated with this

Master Plan may be subject to a Site Plan application and should be prepared in accordance with the Middlesex Centre Site Plan Manual.

### 3.1.7 Municipality of Middlesex Centre Infrastructure Design Standards

Section 4 of the Municipality's Infrastructure Design Standards contains specific engineering and construction guidelines related to the stormwater drainage system, as well as information on infrastructure easements (Section 4.17). Design Standards shall be followed during detailed design and implementation of improvements identified within this Master Plan, including maximum ponding depths of 300mm, and 450mm for landscaped areas.

## 3.2 NATURAL ENVIRONMENT

As part of the Municipal Class EA process, a review of natural heritage features was undertaken to characterize the significance and sensitivity of the natural features in the study area, identify potential environmental effects and recommend appropriate measures in order to avoid or minimize potential negative impacts on the surrounding environment.

For the purposes of this Master Plan, the review was conducted through a desktop review of available federal and provincial databases, and is intended to provide a general framework for future projects. Prior to construction, field investigation may be required to confirm the presence of Species at Risk (SAR) or Significant Wildlife Habitat, and if proposed works may endanger SAR habitat or Significant Wildlife Habitat, a permit will be required under the *Species at Risk Act*/*Endangered Species Act*.

### 3.2.1 Methodology for Data Collection

The following were used as data sources for this report:

- Consultation with the Ministry of Natural Resources and Forestry (MNRF);
- Natural Heritage Information Centre Biodiversity Explorer (NHIC) for Species at Risk records from the past 30 years;
- Land Information Ontario Mapping of natural heritage features;
- Biodiversity Atlases (Breeding Birds of Ontario, Mammals of Ontario, Reptile and Amphibian, and Butterfly);
- eBird Canada;
- Species at Risk in Ontario List (Updated June 20th, 2016);
- *Species at Risk Act* (SARA), Schedule 1

- Upper Thames River Conservation Authority Watershed Report Card 2012 and O. Reg. 157/06 Mapping;
- Department of Fisheries and Oceans Canada (DFO) Distribution of Fish and Mussel Species at Risk Mapping for the Upper Thames River Conservation Authority (2015);
- Municipality of Middlesex Centre Official Plan 2014;
- County of Middlesex Official Plan, Consolidated 2006;
- Middlesex Natural Heritage Systems Study 2014; and
- Upper Thames River Source Protection Area Assessment Report 2015.

### 3.2.2 Field Studies and Investigations

Fieldwork was not incorporated into the natural environment characterization. Species information should be sufficiently updated at the time of project implementation. Fieldwork should be planned and completed at the project onset through discussions with agency staff, subject to the extent of work proposed.

### 3.2.3 Environmental Planning and Policy Documents

#### 3.2.3.1 Provincial Policy Statement

The wise use and management of the natural environment is recognized as a crucial component of ensuring Ontario's long-term prosperity, environmental health and social well-being. Accordingly, the 2014 Provincial Policy Statement (PPS) provides direction for the long-term protection, restoration and improvement of the diversity and connectivity of natural features, the ecological function and biodiversity of natural systems, and the quality and quantity of water at a watershed scale.

As noted in Section 3.1.1 above, Policy 2.1 of the PPS (2014) provides direction for the protection of the natural heritage features, while guidance in this regard is provided through the Natural Heritage Reference Manual (Ministry of Natural Resources, 2010). The natural heritage features to be considered in accordance with the PPS include:

- Significant wetlands (PSW) and significant coastal wetlands;
- Significant habitat of endangered and threatened species;
- Significant woodlands;
- Significant valleylands;
- Significant wildlife habitat;
- Significant areas of natural and scientific interest (ANSIs); and

- Fish habitat.

In southern Ontario, development and site alteration is not permitted in significant habitat of endangered and threatened species or fish habitat except in accordance with provincial and federal requirements. Development and site alteration may be permitted on lands adjacent to significant wetlands, coastal wetlands and the habitat of endangered and threatened species if it is demonstrated that there will be no negative impacts on the natural features or the ecological functions for which the area was identified.

Development is not permitted within, or on lands adjacent to, the other significant natural heritage features unless the ecological function of these lands has been evaluated and it has been demonstrated that no negative impacts on the natural heritage features or their ecological function will occur.

The assessment, selection and implementation of any preferred alternatives should be consistent with the context and direction provided by the policies in the PPS.

#### 3.2.3.2 County of Middlesex Official Plan – Natural Environment Policies

Sections 2.2.1 and 3.4.1 of the County's Official Plan (OP) outlines broad policies for the Natural System which includes Natural Hazards, Natural Environment Areas, Natural Heritage Features, and Groundwater Features. While the policies do not preclude development in these areas, they are intended to protect them from adverse impacts of development.

Schedule 'C' of the OP identifies significant woodlands as well as Areas of Natural and Scientific Interest (ANSI), identified for protection by the Ontario Ministry of Natural Resources and Forestry and aggregate resource areas throughout the County. Schedule 'C' however, is not intended as a land-use schedule, and the use of land within and contiguous to natural features shall proceed in accordance with the underlying land use designations shown on Schedule 'A' (2.2.1.3 – Natural Systems Policies, pg. 2-7), as well as those of the local Municipal OPs.

#### 3.2.3.3 Municipality of Middlesex Centre Official Plan – Natural Environment Policies

The OP promotes the identification, conservation, and protection of significant natural features and functions to prevent incompatible development and minimize potential impacts. The natural features include Natural Environment Areas, which prohibit development and are identified on Schedules A, A-1, A-2, A-3, A-5, A-6, A-7, A-8, A-9, A-10, A-11, as well as Greenland Features where development and site alteration may be permitted, subject to a Development Assessment Report (DAR) (as described in Section 3.8 of the OP). According to the OP, 'development' includes the creation of a new lot, a change in land use, or the construction of buildings and structures requiring approval under the *Planning Act*, but does not include activities that create or maintain infrastructure authorized under the Environmental Assessment process, works subject to the *Drainage Act*, or conservation projects.

Natural Environment Areas include wetlands, significant habitat of Threatened and Endangered species and floodplains. Schedule B of the OP illustrates Greenland Features including significant woodlands and ANSI's. Any development or site alteration within or adjacent to a Greenland Feature, or adjacent to a Natural Environment Area, may be permitted subject to the findings of a DAR.

Natural Hazard Areas include floodplains, steep slopes, and other hazard lands identified by the Conservation Authority Regulation, and are identified on Schedule C of the OP. New development is generally prohibited in such areas to ensure there is no increased risk to life or property, either as a result of or to the new development.

#### 3.2.3.4 Species at Risk Act

The *Species at Risk Act* (SARA) identifies wildlife species considered to be at risk in Canada and designates them as threatened, endangered, extirpated or of special concern. Species at risk (SAR) are identified and assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which is an independent committee of wildlife experts and scientists that makes recommendations to the federal government regarding the status of wildlife species in Canada.

The purpose of SARA is to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened.

The protection and conservation measures afforded by SARA apply to those species identified on Schedule 1 of the *Act.* Other species identified by COSEWIC as SAR that required further assessment in accordance with current assessment criteria are identified on Schedule 2 (Endangered and Threatened) and Schedule 3 (Special Concern) of the *Act*. All listed (Schedule 1) aquatic species and migratory birds in Canada are protected by SARA. Remaining listed species (plants, mammals, reptiles, amphibians) are only protected where they occur on federal lands (I.e. National Parks, First Nations Reserves).

Any activity affecting a listed species, or its critical habitat requires the prior issuance of a permit from the applicable agency, either Environment Canada or Department of Fisheries and Oceans Canada (DFO). Permits may only be issued for scientific research relating to the conservation of the species, where activities are required to benefit a species or to enhance its chances of survival or for incidental impacts. Efforts to avoid, reduce, or minimize impacts must first be employed and activities will not be permitted if they would jeopardize the survival or recovery of the species.

#### 3.2.3.5 Endangered Species Act

The *Endangered Species Act* (ESA) (2007) replaces the original (1971) to provide broader protection for species at risk and their habitats, a stronger commitment to recovery of species, greater flexibility, increased fines and more effective enforcement, as well as greater accountability through government reporting requirements.

The ESA identifies wildlife species considered to be at risk in Ontario and designates them as threatened, endangered, extirpated or of special concern. Provincial species at risk are identified and assessed by the Committee on the Status of Species at Risk in Ontario (COSSARO) which is a committee of wildlife experts and scientists, as well as those who provide Aboriginal traditional knowledge, that classify species according to their degree of risk based on the best available scientific information, community

knowledge and aboriginal traditional knowledge. When COSSARO classifies a species at risk, that classification applies throughout Ontario, unless otherwise noted.

The *Endangered Species Act* protects species at risk and their habitats by prohibiting anyone from killing, harming, harassing or possessing protected species, as well as prohibiting any damage or destruction to the habitat of species identified on the Species at Risk in Ontario (SARO) list. All species on the SARO list are provided with general habitat protections under the *Endangered Species Act*, which protect areas that species depend on to carry out their life processes, such as reproduction, rearing, hibernation, migration, or feeding.

Any activity that may impact a protected species or its habitat requires the prior issuance of a permit from the MNRF. Such permits may only be issued under certain circumstances, which are limited to activities required to protect human health and safety, activities that will assist in the protection or recovery of the species, activities that will result in an overall benefit to the species or activities that may provide significant social or economic benefit without jeopardizing the survival or recovery of the species in Ontario.

Recent changes to the *Endangered Species Act* allow for specific infrastructure projects to proceed without the prior issuance of a permit. For these activities the work must be registered, and certain rules and guidelines adhered to. Consultation with the ministry is recommended prior to the works starting in order to ensure compliance with the *Endangered Species Act*.

#### 3.2.3.6 Fisheries Act

The Government of Canada is responsible for the management of fisheries resources in Canada through the *Fisheries Act*, administered primarily by DFO. The *Fisheries Act* addresses national interests in marine and fresh waters. On June 21, 2019, changes to the Act (Bill C68) received royal assent and became law. On August 28, 2019 provisions of the new *Fisheries Act* came into force.

The *Fisheries Act* includes prohibitions against the death of fish and the harmful alteration, disruption or destruction (HADD) of fish habitat. It extends protection to all fish and fish habitat. When the death of fish or HADD cannot be avoided or mitigated, a *Fisheries Act* Authorization is required.

Recent science has demonstrated that municipal drains have similar fish species, diversity, and biomass as natural watercourses and support the commercial, recreational, and indigenous fisheries (DFO, 2017).

To facilitate the maintenance and repair of municipal drains with respect to authorization under the *Fisheries Act*, DFO has created a guidance document which should be reviewed prior to project information in order to determine authorization and approvals under the *Fisheries Act.*

#### 3.2.3.7 Migratory Birds Conservation Act

The federal *Migratory Birds Convention Act*, 1995 (MBCA) protects migratory birds and their nests (S.4). Section 6 of the Migratory Bird Regulations (C.R.C., c. 1035) prohibits the disturbance, destruction or taking of a nest, egg, or nest shelter of a migratory bird. Nest disturbance during vegetation clearing may

be considered as “incidental take” and is a contravention of the MBCA. 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).

#### 3.2.3.8 Conservation Authority Regulations

Upper Thames River Conservation Authority, Ausable Bayfield Conservation Authority and St. Clair Region Conservation Authority are responsible for approval of development or site alteration within hazardous areas adjacent to shorelines, watercourses and wetlands within their respective geographical jurisdictions. These areas, known as the “Regulation Limit”, are detailed in Ontario Regulation 157/06 and Ontario Regulation 97/04 and Ontario Regulation 171/06: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses, and its accompanying mapping. The purposes of these regulations are to protect life and property from flooding, erosion and unstable slopes.

#### 3.2.3.9 Summary of Policy Implications

This Master Plan process recognizes the objectives of the policies noted above and the requirements of the individual agencies. The corresponding opportunities and constraints established by these policies and supporting guidelines should be recognized and addressed throughout the planning process, as well as through implementation, including the identification of appropriate mitigation, restoration, and enhancement measures to offset potential negative impacts. The intent of this review is to demonstrate how the proposed project complies with the applicable policies noted above. As such, this approach is to recognize the objectives of the policies noted above and the requirements of the individual agencies charged with their implementation. This information will be considered during the establishment of the preferred alternatives and identification of appropriate mitigation, restoration and, where feasible, enhancement opportunities.

### 3.2.4 Existing Natural Features and Functions

Refer to Appendix B.1 for Figures B1-1 through B1-11, which identify mapped Natural Features found within the study area. Note the extent of features should be

#### 3.2.4.1 Aquatic Features and Species

Table 3-2 summarizes the presence of watercourses and municipal drains within each settlement area and records of aquatic species at risk from the NHIC database (MNRF 2019a) and DFO’s species at risk maps (DFO 2020).

**Table 3-1 Watercourse Characteristics and Aquatic Species at Risk Records**

| Settlement Area | Watercourses/Drains – Available Information | Aquatic Species at Risk Status* and Applicable Regulation(s) (Provincial and Federal) |
|---|---|---|
| **Arva** | • A tributary of Medway Creek crosses through the northern section of the settlement area and has the following attributes (as per background data sources):<br>– Thermal regime: Coldwater<br>– Flow regime: Permanent<br>– A Class D drain (permanent, cool/coldwater, sensitive species present) is located just outside the northern edge of the SA.<br>• UTRCA regulated areas (associated with the above watercourses)<br>• Extent of fish species associated with the drain are available in Appendix B.1 Figure B1-1. | • Fish<br>– Black Redhorse (*Moxostoma duquesnei*) – THR (ESA and SARA)<br>– Northern Sunfish (*Lepomis peltastes*), SC (not regulated by the ESA or SARA)<br>– Silver Shiner (*Notropis photogenis*), THR (ESA and SARA)<br>• Mussels<br>– Wavy-rayed Lampmussel (*Lampsilis fasciola*) – THR (ESA), SC (SARA) |
| **Ballymote** | • Tile drains near Medway Road (no additional information)<br>• UTRCA regulated areas | • None |
| **Birr** | • No watercourses or drains<br>• UTRCA regulated area present at southeastern settlement area boundary | • There are no records from within the settlement area but there are aquatic SAR records from nearby Medway Creek |
| **Bryanston** | • Class F drain (intermittent) located outside the western boundary of the settlement area. Extent of fish species associated with the drain are available in Appendix B.1 Figure B1-4. | • None |
| **Denfield** | • No watercourses or drains within the settlement area but Nairn Creek (permanent, cool/coldwater, sensitive species present) and Class D drains are present near the western boundary of the settlement area.<br>• ABCA regulated areas (associated with Nairn Creek) overlap the settlement area** | • None |

| Settlement Area | Watercourses/Drains – Available Information | Aquatic Species at Risk Status* and Applicable Regulation(s) (Provincial and Federal) |
|---|---|---|
| **Ilderton** | • Class F drain (intermittent) along the southeast edge of the settlement area (no additional information).<br>• An unrated drain crosses the southeast corner (no additional information)<br>• SCRCA regulated area along the northern boundary of the settlement area (associated with wetlands)<br>• UTRCA regulated area in the southeast corner of settlement area (associated with Oxbow Creek) | • None |
| **Kilworth/Komoka** | • Oxbow Creek passes through the settlement area and has the following attributes (as per background data sources):<br>– Thermal regime: Coldwater<br>– Flow regime: Permanent<br>– No fish community data available.<br>• Class F drains (intermittent). No fish community data available.<br>• Class C drains (permanent, warmwater, no sensitive species). No fish community data available.<br>• Class D drain (cool/coldwater, sensitive species present) in the southern section of the settlement area<br>• This settlement area is bordering the Thames River<br>• UTRCA regulated areas associated with Thames River, Oxbow Creek and drains<br>• | Fish<br>• Black Redhorse - THR (ESA and SARA)<br>• Silver Shiner - THR (ESA and SARA)<br>• Eastern Sand Darter (*Ammocrypta pellucida*) – END (ESA), THR (SARA)<br>• Northern Brook Lamprey (*Ichthyomyzon fossor*) - SC (not regulated by the ESA or SARA)<br>• Northern Sunfish - SC (not regulated by the ESA or SARA)<br>• Pugnose Minnow (*Opsopoeodus emiliae*) – THR (ESA and SARA)<br>• Spotted Sucker (*Minytrema melanops*) – SC (not regulated by the ESA or SARA)<br><br>Mussels<br>• Fawnsfoot (*Truncilla donaciformis*) – END (ESA and SARA)<br>• Mapleleaf (*Quadrula quadrula*) – SC (not regulated by the ESA or SARA)<br>• Rainbow (*Villosa iris*) – SC (not regulated by the ESA or SARA)<br>• Threehorn Wartyback (*Obliquaria reflexa*) – THR (ESA and SARA) |
| **Lobo** | • No watercourse or drains | • None |
| **Melrose** | • An unrated drain crosses the western section of settlement area (no additional information)<br>• UTRCA regulated areas | • None |

| Settlement Area | Watercourses/Drains – Available Information | Aquatic Species at Risk Status* and Applicable Regulation(s) (Provincial and Federal) |
|---|---|---|
| **Poplar Hill – Coldstream** | • Sydenham River passes through the settlement area and has the following attributes (as per background data sources):<br>– Thermal regime: Warmwater<br>– Flow regime: Permanent<br>– No fish community data available<br>• Class C drain is present (permanent, warmwater, no sensitive species)<br>• UTRCA regulated areas associated with Sydenham River and Sydenham River wetlands | • Northern Sunfish – SC (not regulated by the ESA or SARA) |

Notes:

* END – Endangered, THR – Threatened, SC – Special Concern
** ABCA Regulated Areas data were not available for illustration but can be viewed using the ABCA's Mapping Viewer available through the mapping portal at: https://www.abca.ca/planning/mappingportal/

### 3.2.4.2 Vegetation Communities and Provincially Rare or at-Risk Plant Species

Table 3-3 below summarizes the main vegetation communities that are present within each settlement area based on a desktop assessment of aerial imagery. Records of provincially rare plants and/or plant SAR records from the NHIC database are also reported. The absence of records for a settlement area does not necessarily indicate that no rare species are present because survey effort varies across the province.

Provincial ranks (S-ranks) are used by the NHIC to set protection priorities for rare species and vegetation communities. They are based on the number of factors such as abundance, distribution, population trends and threats in Ontario and are not legal designations. By comparing the global and provincial ranks, the status, rarity, and the urgency of conservation needs can be determined. Species with provincial ranks of S1 to S3, and those tracked by the MNRF, are considered SOCC. Provincial S-ranks are defined as follows:

S1: Critically imperiled; usually fewer than 5 occurrences
S2: Imperiled; usually fewer than 20 occurrences
S3: Vulnerable; usually fewer than 100 occurrences
S4: Apparently secure; uncommon but not rare, usually more than 100 occurrences
S5: Secure, common, widespread and abundant

S-rank followed by a "?" indicates the rank is still uncertain.

**Table 3-2 Vegetation Communities and Vegetation Species at Risk Records**

| Settlement Area | Vegetation communities | Records of rare or at risk plant species from NHIC database* |
|---|---|---|
| **Arva** | • Woodland, wetland, agricultural fields, meadow, residential | • None |
| **Ballymote** | • Residential, agricultural | • None |
| **Birr** | • One small woodlot, residential, agricultural, hedgerows | • None |
| **Bryanston** | • Residential, agricultural | • None |
| **Denfield** | • Residential, agricultural | • None |
| **Ilderton** | • Woodland, wetland, agricultural, residential, meadow | • None |
| **Kilworth/Komoka** | • Woodlands, meadow, wetland, agricultural, residential | • Cleland's Evening Primrose (*Oenothera clelandii*) - S1<br>• Rigid Sedge (*Carex tetanica)* – S3<br>• Great Plains Ladies'-tresses (*Spiranthes magnicamporum*) – S3?<br>• Eastern Yellow Stargrass (*Hypoxis hirsute*) – S2S3<br>• Hairy-fruited Sedge (*Carex trichocarpa*) – S3<br>• Blue Ash (*Fraxinus quadrangulate*) – S2?, THR<br>• Butternut (*Juglans cinereal*)- S2?, END** |
| **Lobo** | • Agricultural, residential | • None |
| **Melrose** | • Woodland, agricultural, residential | • None |
| **Poplar Hill – Coldstream** | • Woodland, wetland, residential, agricultural | • Striped Cream Violet (S3) |

Notes:
* END – Endangered, THR – Threatened, SC – Special Concern
** Species ranked as END and THR receive protection by the ESA, 2007

### 3.2.4.3 Wildlife

The NHIC database was reviewed to identify records of SAR within or near each settlement area. Because the database is not comprehensive, wildlife atlases and online databases were also reviewed to identify SAR that have the potential to be present in each settlement area based on the species range and a desktop assessment of habitat types present in each settlement area. Refer to Table 3-4 for a summary of threatened and endangered wildlife.

**Table 3-3 Wildlife Species at Risk Records**

| Settlement Area | Records from Natural Heritage Information Centre database* | Potential SAR |
|---|---|---|
| **Arva** | • Snapping Turtle (*Chelydra serpentine*) – SC | • Eastern Hog-nosed Snake (*Heterodon platirhinos*) – THR<br>• Northern Map Turtle (*Graptemys geographica*) – SC<br>• Spiny Softshell (*Apalone spinifera)* – END<br>• Grassland bird SAR**<br>• Forest bird SAR<br>• END bats |
| **Ballymote** | • None | • Eastern Hog-nosed Snake – THR<br>• Queensnake (*Regina septemvittata*) – END<br>• Snapping Turtle – SC<br>• Northern Map Turtle – SC<br>• Grassland bird SAR |
| **Birr** | • Bobolink (*Dolichonyx oryzivorus*) – THR*** | • Grassland bird SAR<br>• END bats |
| **Bryanston** | • None | • Grassland bird SAR |
| **Denfield** | • None | • Grassland bird SAR |
| **Ilderton** | • Snapping Turtle – SC | • Grassland bird SAR<br>• Forest bird SAR<br>• END bats |
| **Kilworth/Komoka** | • Bank Swallow (*Riparia riparia*) – THR<br>• Northern Map Turtle (*Graptemys geographica*) – SC<br>• Queensnake – END<br>• Spiny Softshell – END<br>• Eastern Meadowlark (*Sturnella magna*) – THR<br>• | • Blanding's Turtle (*Emydoidea blandingii*) – THR<br>• Snapping Turtle – SC<br>• Eastern Hog-nosed Snake – THR<br>• Grassland bird SAR<br>• Forest bird SAR<br>• Marsh bird SAR<br>• END bats |
| **Lobo** | • None | • Grassland bird SAR<br>• END bats |
| **Melrose** | • None | • Grassland bird SAR<br>• END bats |
| **Poplar Hill – Coldstream** | • Bobolink – THR<br>• Eastern Meadowlark – THR<br>• Wood Thrush (*Hylocichla mustelina*), SC | • Forest bird SAR<br>• Grassland SAR<br>• Marsh bird SAR<br>• Bat SAR |

Notes:
* END – Endangered, THR – Threatened, SC – Special Concern
** Stantec has provided all information available.
*** Species ranked as END and THR receive protection by the ESA, 2007

### 3.2.4.4 Significant Wetlands and Woodlands

The Land Information Ontario (LIO) database, along with the Middlesex Centre Official Plan and Middlesex Natural Heritage Study was reviewed in order to identify mapped wetlands and woodlands.

**Table 3-4 Provincially Significant Wetlands within the Study Area**

| Settlement Area | Wetlands | Significant woodlands |
|---|---|---|
| **Arva** | • Arva Moraine Wetland Complex PSW | • Two significant woodlands |
| **Ballymote** | • None | • None |
| **Birr** | • None | • None |
| **Bryanston** | • None | • None |
| **Denfield** | • A constructed wetland is located outside of the settlement area boundary | • There are no significant woodlands within the settlement area but there is one significant woodland located near the western edge of the settlement area |
| **Ilderton** | • Hyde Park Wetland (evaluated, not significant)<br>• Small constructed wetland in Meadowcreek Park | • Five significant woodlands are present within this settlement area |
| **Kilworth/Komoka** | • Komoka Park Wetland Complex PSW<br>• Komoka/South Strathroy Creek PSW | • Five significant woodlands are present within this settlement area: |
| **Lobo** | • None | • One significant woodland |
| **Melrose** | • Oxbow Creek PSW borders the northern edge of the settlement area | • Two significant woodlands |
| **Poplar Hill – Coldstream** | • Sydenham River Wetland Complex PSW | • One significant woodland located along the Sydenham River |

### 3.2.5 Drinking Water Source Protection

Drinking Water Source Protection represents the first barrier in the protection of drinking water. Protecting surface and ground water from becoming contaminated or overused will ensure a sufficient supply of clean, safe drinking water. The *Clean Water Act 2006* (CWA) is intended to protect existing and future sources of drinking water as part of the government's overall commitment to protecting human health and the environment. The CWA sets out a framework for source protection planning on a watershed basis with Source Protection Areas established based on the watershed boundaries of Ontario's 36 Conservation Authorities.

The Municipality of Middlesex Centre is located within the Upper Thames River Source Protection Area, the St. Clair Region Source Protection Area, and the Lower Thames River Source Protection Area, which together make up the Thames-Sydenham Source Protection Region (TSSPR). Areas within the Thames-Sydenham Source Protection Region (TSSPR) are subject to the policies of the Upper Thames River Source Protection Plan (SPP), which was approved in 2015 under the CWA.

The Assessment Report for the Upper Thames River SPA identifies a Wellhead Protection Area (WHPA) associated with the various groundwater well systems located throughout eleven settlements areas within Middlesex Centre, as well as Significant Groundwater Recharge Areas (SGRAs) and Highly Vulnerable Aquifers (HVAs). Mapping of these areas have been compiled within the Thames-Sydenham and Region Source Protection Online Mapping System (https://www.sourcewaterprotection.on.ca/approved-source-protection-plan/interactive-mapping/).

WHPAs are vulnerable areas identified around groundwater sources of drinking water, where it is desirable to regulate or monitor drinking water threats. WHPAs A through D are identified for various groundwater well systems located throughout Middlesex Centre and are defined below:

- WHPA-A – 100 m fixed radius around each well
- WHPA-B – 2 year time of travel to the well, excluding the area of WHPA-A
- WHPA-C – 2 to 5 year time of travel to the well
- WHPA-D – 5 to 25 year time of travel to the well

There is a total of two (2) WHPAs within Middlesex Centre; the Melrose well system and the Birr well system. WHPAs A through D are identified for both the Melrose well system and the Birr well system.

SGRAs are areas considered significant in maintaining the water level within an aquifer through the infiltration of surface water (rain and snow). HVAs are aquifers that are considered easily affected by both human and natural processes.

As part of the Upper Thames River SPA Assessment Report, vulnerable areas are mapped, and are assigned a vulnerability score. Vulnerability scores then determine the type of SPP policies that apply within the specific areas. Legally binding policies pertaining to "Significant Drinking Water Threats" have apply in areas with a vulnerability score of 10.

### 3.2.5.1 Arva

Within the Arva Community Settlement Area, portions are identified as Significant Groundwater Recharge Areas with a Vulnerability Score of 4 and of 6. It is not anticipated that storm drainage infrastructure within the settlement area will pose significant threats or trigger policies of the SPP.

### 3.2.5.2 Ballymote

Within the Ballymote Hamlet Area, portions are identified as Significant Groundwater Recharge Areas with a Vulnerability Score of 6. It is not anticipated that storm drainage infrastructure within the settlement area will pose significant threats or trigger policies of the SPP.

### 3.2.5.3 Birr

A WHPA (WHPA-A, B, and C and D) exists in the Hamlet of Birr, with vulnerability scores ranging from 10 to 6, thus legally binding policies pertaining to “Significant Drinking Water Threats” apply. Some storm drainage infrastructure located within the WHPA may pose a threat and trigger policies of the SPP. Mitigation measures (including avoidance of the WHPA) will be considered during the evaluation of alternatives and siting of storm drainage infrastructure. Refer to Figure 3.2.1 for an overview of the WHPA.

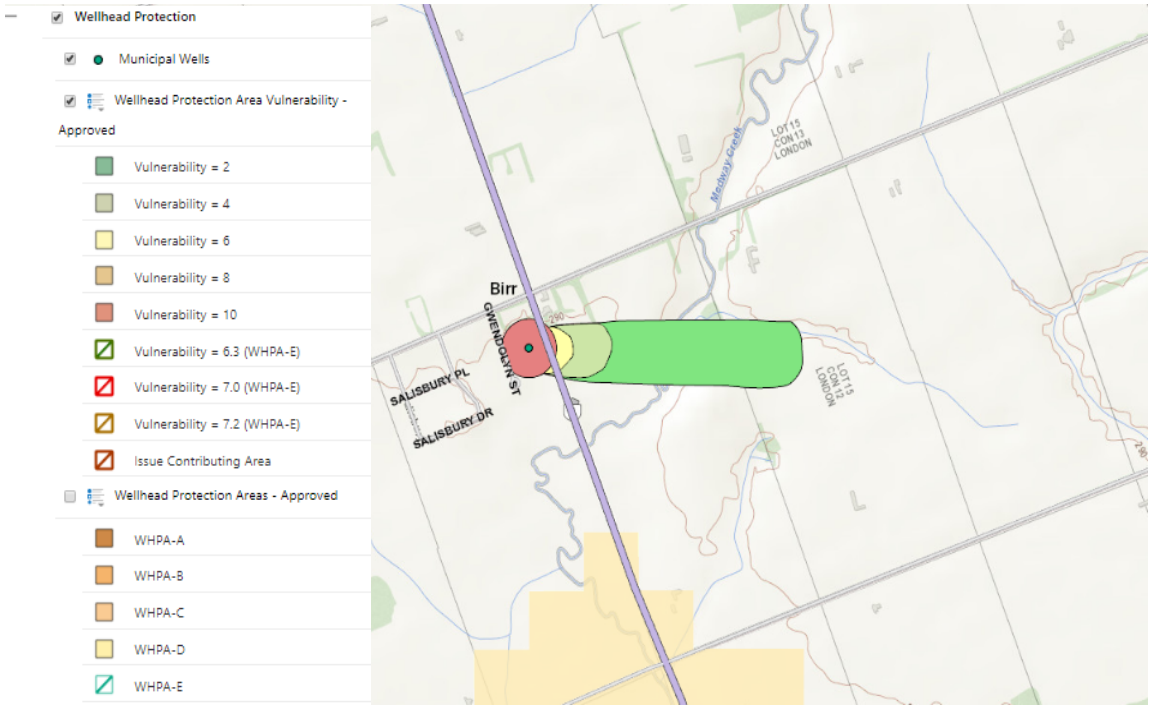



**Figure 3.2.1 Birr WHPA (Thames-Sydenham and Region, https://maps.thamesriver.on.ca/)**

### 3.2.5.4 Bryanston

Within the Bryanston Hamlet Area, there are no vulnerable areas identified.

### 3.2.5.5 Denfield

Within the Denfield Hamlet Area, there are no vulnerable areas identified.

### 3.2.5.6 Ilderton

Within the Ilderton Urban Settlement Area, portions are identified as HVA, and SGRA with vulnerability scores ranging from 6 to 2. It is not anticipated that storm drainage infrastructure within the settlement area will pose significant threats or trigger policies of the SPP.

### 3.2.5.7 Lobo

The Settlement Area boundaries of Lobo are generally free of vulnerable areas. Areas immediately surrounding the Settlement Area however, are identified as SGRA with a vulnerability score ranging from 4 to 2.

### 3.2.5.8 Melrose

A WHPA (WHPA-A, B, C and D) exists within the Melrose Hamlet area, with vulnerability scores ranging from 10 to 2, thus legally binding policies pertaining to “Significant Drinking Water Threats” apply. Some storm drainage infrastructure located within the WHPA may pose a threat and trigger policies of the SPP. Mitigation measures (including avoidance of the WHPA) will be considered during the evaluation of alternatives and siting of storm drainage infrastructure. Refer to Figure 3.2.2 for an overview of the WHPA.


**Figure 3.2.2 Melrose WHPA (Thames-Sydenham and Region, https://maps.thamesriver.on.ca/)**

#### 3.2.5.9 Vulnerable Areas Policies

Within vulnerable areas, policies under the *Clean Water Act* mandate the management and in some cases prohibit of certain land use activities, from fuel storage, pesticide use and storage, agricultural activities, creation/operation of municipal infrastructure, and many more. Municipalities and other levels of government are responsible for implementing policies of SPP through Official Plan and Zoning Bylaw updates, Risk Management Plans, through the appointment of a Risk Management Officer (RMO), and through prescribed instruments (such as an Environmental Compliance Approval (ECA) issued by the MECP for municipal infrastructure activities). RMOs are responsible for reviewing new development applications, planning, or building permits that may impact SWP areas, and for establishing legally-binding Risk Management Plans with properties were activities identified as significant threat activities occur. The MECP implements the policies of the SPP by requiring supplementary source protection reporting and design and operational requirements as part of an ECA.

As part of the 2015 amendments to the MEA Class EA document, proponents must have regard for the CWA and the policies set out in the approved SPPs. It is not anticipated that the stormwater servicing alternatives will have significant impacts on existing source protection areas. The potential for impacts will be identified during the evaluation of alternatives, and for potential impacts identified, mitigation measures will be recommended.

## 3.3 CULTURAL ENVIRONMENT

### 3.3.1 Archaeological Resources

Much of the study area retains archaeological potential. Recommendations for archaeological assessment prior to design and construction will be identified for projects identified within this Master Plan. For storm drainage works within future development areas, it is anticipated that clearance of archaeological potential will be undertaken through future Planning Act applications.

### 3.3.2 Built Cultural Heritage and Cultural Heritage Landscapes

The potential for storm drainage solutions to impact built cultural heritage and cultural heritage landscapes is considered minimal and will be reviewed as part of the evaluation of alternative solutions. Where the potential for impact exists, recommendations for more detailed assessments will be identified.

## 3.4 EXISTING DRAINAGE

A review of the existing drainage conditions was completed, and the study area was broken down into catchment areas based on the available drawings provided by the Municipality of Middlesex Centre, municipal drainage reports, topographic mapping, soil conditions, and site visit observations. Figures B2-1 to B2-10 in Appendix B.2 illustrate the study area and catchment areas, including existing drainage infrastructure and known flooding concerns. The following sections include descriptions of the existing drainage infrastructure for each catchment area.

### 3.4.1 Arva

The Arva Settlement Area is comprised of two significant storm drainage catchments:

1. Arva Built-Up Area; and
2. Arva Development Area.

**Arva Built-up Area**

The Arva Built-Up Area includes most of the existing development located in the Settlement Area. Minor flows are collected and conveyed by existing storm sewers that discharge to either the existing mill pond located north of Medway Road, or Medway Creek, via an outfall located south of Medway Road. The available property line information shows that the neighboring residents own the mill pond.

The following key issues were identified based on background information review and site visit observations:

- The mill pond outlet structure design is prone to clogging, as confirmed by MOMC staff;
- Subsidence of the existing gabion mats over the mill pond outlet culvert was observed;
- Minor flows for much of the catchment are collected and conveyed by the Arva Drainage Works Municipal Drain; and
- Overland flow routes from road low points cross private properties.

A review of the minor system capacity was not completed since no storm sewer design sheets were available. However, based on experience in other Settlement Areas, the existing storm sewers are probably not designed in accordance with the current MOMC standards.

**Arva Development Area**

This catchment is comprised of active agricultural land and existing development located on the west side of Highway 4. Runoff from this area travels westward as overland flow to Medway Creek. Future development in this area will likely consist of a mixture of single family and medium density residential development.

The Middlesex Soils Survey suggests that the local soils are primarily comprised of Bryanston silt loam. The permeability of this soil tends to be low, which likely limits opportunities to treat stormwater using infiltration methods.

Refer to Figure B2-1 in Appendix B.2 for the existing drainage overview for Arva.

### 3.4.2 Ballymote

The Ballymote Settlement Area is located at the intersection of Medway Road and Highbury Avenue North. Drainage servicing is provided by shallow storm sewers and roadside ditches that outlet to the Ballymote North, Ballymote East, and Highbury-Armitage Municipal Drains. Both the Ballymote North and Highbury-Armitage Municipal Drains convey runoff from significant agricultural areas located upstream of the Ballymote Settlement Area. The Ballymote East Drain provides an outlet for a significant portion of

the Settlement Area south of Medway Road, but the available municipal drain drawings suggest that the drain capacity is likely very limited.

While there are no available storm sewer design sheets for the existing storm network, the existing storm sewers are probably not designed in accordance with the current MOMC standards. However, no flooding complaints were identified through the initial public consultation.

The Middlesex Soils Survey suggests that the local soils are primarily comprised of Teeswater silt loam. The permeability of this soil tends to be low, which limits opportunities to treat stormwater using infiltration methods.

Refer to Figure B2-2 in Appendix B.2 for the existing drainage overview for Ballymote.

### 3.4.3 Birr

Minor flows from most of the Birr Settlement Area are collected by an existing storm sewer network that discharges to Medway Creek. The existing storm sewers cross private property south of the Birr Settlement Area. Major flows are generally conveyed southward by the exiting right-of-ways. However, significant temporary surface ponding may occur at the southern limits of Gwendolyn Street and Salisbury Drive, as there are no significant overland flow routes to convey surface water during severe storm events that exceed the minor system capacity.

The future development area located in the northwest portion of the Settlement Area is currently active agricultural land. Runoff from this area is conveyed westward by the 13 Mile Road roadside ditch to the Bilyea-Corsaut Municipal Drain.

Refer to Figure B2-3 in Appendix B.2 for the existing drainage overview for Birr.

### 3.4.4 Bryanston

Drainage within the Bryanston Settlement Area is provided by roadside ditches that convey stormwater to the Smith Drain, Williams Drain, Bryanston Drain, and Pattyn Drainage Works. Surface ponding was observed on the west side of Highbury Avenue south of 12 Mile Road during the April 18, 2018 site visit. Furthermore, the perched Highbury Avenue culvert located approximately 200 m north of Plover Mills Road causes surface ponding on the east side of the road.

Refer to Figure B2-4 in Appendix B.2 for the existing drainage overview for Bryanston.

### 3.4.5 Denfield

Drainage servicing on Denfield Road is provided by existing roadside ditches and a shallow local storm sewer. Two outlets discharge the runoff from Brookfield Street to the Stanley Creek Drainage Works/Nairn Creek. Flooding noted by municipal staff at the ditch inlet catchbasin that conveys stormwater to the northern outlet is likely caused by vegetation growing in the channel at the downstream headwall. The existing storm sewers that drain to the southern Brookfield Street outlet are not designed in accordance with the current MOMC standards.

An accepted SWM strategy has been prepared by the developer's engineer for future single-family residential development on Denfield Road.

Refer to Figure B2-5 in Appendix B.2 for the existing drainage overview of Denfield.

### 3.4.6 Ilderton

The Ilderton Settlement Area is comprised of four significant storm drainage catchments:

1. Ilderton Drain No. 1;
2. Ilderton Drain No. 2;
3. Ilderton Drain No. 3; and
4. South Ilderton Development Area.

**Ilderton Drain No. 1**

Ilderton Drain No. 1 is the surface water receiver for the western portion of the Ilderton Settlement Area. Minor flows from this area are collected and conveyed by existing storm sewers and major flows are conveyed by the urban road cross sections. Several stormwater management facilities, including the Deer Haven Estates Subdivision SWM pond and the Timberwalk Subdivision SWM pond provide both water quality and quantity treatment to the local runoff. Runoff from future development in this area will be treated by the existing Timberwalk Subdivision SWM pond.

**Ilderton Drain No. 2**

The Ilderton Drain No. 2 drainage area is mainly comprised of single family residential development. Minor flows from this area are collected and conveyed by existing storm sewers and major flows are conveyed by the urban road cross sections. The existing Meadowcreek Subdivision SWM pond provides both water quality and quantity treatment to the runoff from much of the Ilderton Drain No. 2 service area. The pond is designed to control the post-development peak discharges to pre-development magnitudes for all design events up to and including the 100-year storm and to provide MECP Normal Protection Level water quality treatment.

Several fragmented municipal drains located within the upstream urban area convey stormwater from the municipal right-of-ways across private property. Furthermore, flooding has been reported at the Van Bussell Agreement Drain.

MOMC staff noted that the Van Bussell Agreement Drain is substantially blocked with accumulated sediment and that the municipality plans on replacing the existing 400 mm diameter concrete drainage tile with a proposed 600 mm diameter PVC pipe to improve the system capacity and mitigate local flood concerns.

MOMC staff noted that portions of the existing subdivision located east of Hyde Park Road were constructed without storm PDCs. As a result, sump pump discharges to the ground surface have caused asphalt deterioration in the local right-of-ways.

**Ilderton Drain No. 3**

This catchment area is comprised of existing single family residential lots located on the north side of Ilderton Road and the proposed Clear Skies residential subdivision. Runoff from the north side of the Ilderton Road right-of way is collected and conveyed by a branch of Ilderton Drain No. 3. The existing drain has limited capacity and is not designed in accordance with current MOMC design standards. Furthermore, the are no curbs on this portion of Ilderton Road and major flows from the right-of-way enter properties on the south side of the road during severe storm events.

Based on the information presented in the subdivision SWM report, all runoff from the proposed Clear Skies Subdivision is treated by a proposed SWM pond. Minor flows from the proposed subdivision are conveyed to the SWM pond by proposed local storm sewers and major flows are conveyed by the proposed right-of-ways. The pond discharges to a proposed trunk storm sewer located on the south side of the Ilderton Road right-of-way that conveys stormwater eastward to the Oxbow Drain.

**South Ilderton Development Area**

The South Ilderton Development area is comprised of undeveloped agricultural lands drained by the Hughes Charlton Municipal Drain, which discharges to Oxbow Creek. The MOMC Official Plan identifies these lands as Settlement Employment and Commercial.

The Middlesex Soils Survey suggests that the local soils are primarily comprised of Huron silt loam and Bryanston silt loam. The permeabilities of these soils tends to be low, which limits opportunities to treat stormwater using infiltration methods.

Refer to Figure B2-6 in Appendix B.2 for the existing drainage overview of Ilderton.

### 3.4.7 Komoka

The Komoka Settlement Area is comprised of six significant storm drainage catchments:

1. Komoka Drain No. 1;
2. Komoka Drain No. 2;
3. Komoka Drain No. 3;
4. Valleyview Subdivision;
5. West Komoka Development Area; and
6. Northeast Komoka Development Area.

**Komoka Drain No. 1**

Runoff from most of this catchment is conveyed by Komoka Drain No. 1 and the Tunks Lane Municipal Drain to privately owned ponds located south of Glendon Drive. The existing municipal drains are not designed in accordance with the current MOMC storm sewer design standards. However, no flooding complaints were identified through the initial public consultation. Furthermore, SWM reports for previously completed developments in the Komoka Settlement Area suggest that the local soils are highly

permeable, resulting in lower runoff volumes than other similar urbanized areas located within the municipality.

Surface water connections from the receiving ponds to the downstream neighboring ponds are limited. The ponds located east of Komoka Road are connected by small diameter CSP culverts, and an outlet structure conveys water from the Komoka Provincial Park pond directly to the Thames River. The outlet structure was recently reconstructed with a stoplog arrangement that allows the pond depth to be controlled. Ontario Parks is planning to reduce the normal water level in its pond to provide separation from the neighboring privately owned pond.

On the west side of Komoka Road, the pond at 22447 Komoka Road has a direct connection to the neighboring pond at 22393 Komoka Road, which discharges westward to the neighboring pond via a valved pipe outlet. The valve is occasionally operated by the 22393 Komoka Road pond owner to reduce water levels, but discharges are limited to prevent the downstream pond from spilling into the trout farm ponds located to the north. The 22393 Komoka Road pond owner has communicated concerns with the quantity and quality of surface water entering his pond, noting that water levels have gradually risen in the pond over the past 20 years and that a fish kill occurred during spring 2018. Gravel extraction is ongoing at 22353 Komoka Road and there is no known surface water outlet from these ponds to the Thames River.

Proposed development within this catchment includes future commercial development near Tunks Lane and the proposed Glendon Drive Widening, as identified in the 2018 Glendon Drive Streetscape Environmental Assessment.

The Middlesex Soils Survey suggests that the local soils are primarily comprised of Caledon and Burford fine sandy loams. Since the permeability of these soils tends to be high, SWM treatment using infiltration methods may be feasible in this area, provided that local groundwater levels are sufficiently low.

**Komoka Drain No. 2**

Komoka Drain No. 2 conveys runoff from a single family residential urban area to Komoka Creek. The runoff collected by the drain does not receive peak flow control or water quality treatment. This is a concern, since the information provided in the 2017 UTRCA Komoka Creek Watershed Report Card suggests that Komoka Creek is a sensitive coldwater stream.

Runoff from the Prince Street Subdivison is conveyed to an existing SWM pond which provides all necessary stormwater treatment. The pond has no surface water outlet and all flows are released via infiltration and evaporation.

The Middlesex Soils Survey suggests that the local soils are primarily comprised of Caledon and Plainfield fine sandy loams. Since the permeability of these soils tends to be high, SWM treatment using infiltration methods may be feasible in this area, provided that local groundwater levels are sufficiently low.

**Komoka Drain No. 3**

Komoka Drain No. 3 conveys both major and minor flows from the northwest portion of the Komoka Settlement Area to Komoka Creek. The runoff collected by the drain does not receive peak flow control or water quality treatment. This is a concern, since the information provided in the 2017 UTRCA Komoka Creek Watershed Report Card suggests that Komoka Creek is a sensitive coldwater stream. Frank Drain conveys runoff from a substantial external drainage area located north of the CP Railway line to Komoka Drain No. 3.

This catchment includes a future development area located on the west side of Komoka Road.

**Valleyview Subdivision**

The runoff from the existing Valleyview Subdivision is conveyed by local storm sewers and overland flow routes to a local SWM facility that provides all necessary stormwater treatment. The SWM facility discharges to Oxbow Creek.

**West Komoka Development Area**

The West Komoka Development Area is comprised of undeveloped agricultural land on the north side of Glendon Drive. Runoff from the eastern portion of this catchment travels as shallow surface flow towards Komoka Creek, which is a sensitive coldwater stream. Runoff from the western portion of this catchment travels southward to the existing Glendon Drive culvert. Given the local sandy soils, the flat topography, and the absence of a defined overland flow route, most rainfall on this catchment likely infiltrates into the ground.

**Northeast Komoka Development Area**

The Northeast Komoka Development Area is comprised of a former gravel quarry and undeveloped agricultural land on the south side of Oxbow Drive. The former quarry has no surface water outlet, so runoff from this portion of the catchment leaves the quarry pond via evaporation and subsurface flow. Runoff from the agricultural area travels eastward as shallow surface flow towards Oxbow Creek.

The 2017 Oxbow Creek Watershed Report Card suggests that coldwater conditions occur in some portions of Oxbow Creek and that much of the stream has the potential to provide coldwater habitat with continued rehabilitation.

The Middlesex Soils Survey suggests that the soils in the eastern portion of the catchment are primarily comprised of Brant silt loams. Since the permeability of these soils tends to be low, SWM treatment using infiltration methods probably isn't feasible in this area.

Refer to Figure B2-7 in Appendix B.2 for the existing drainage overview of Komoka.

### 3.4.8 Kilworth

The Kilworth Settlement Area is comprised of four significant storm drainage catchments:

1. Kilworth Glendon Drive Area
2. West Kilworth Development Area
3. Jefferies Road Outlet
4. Kilworth Park Drive Outlet
5. Blackburn Crescent Outlet

**Kilworth Glendon Drive Area**

The Kilworth Glendon Drive Area is mostly comprised of undeveloped agricultural land. Runoff from the western portion of the catchment travels as shallow surface flow to the Komoka Settlement Area and is collected and conveyed downstream by the Tunks Lane Municipal Drain. Runoff from the eastern portion of the catchment travels as shallow surface flow to Oxbow Creek.

The Middlesex Soils Survey suggests that the local soils are primarily comprised of Caledon fine sandy loam and Brant silt loam. Since the permeability of the Caledon fine sandy loam tends to be high, SWM treatment using infiltration methods may be feasible in this area, provided that local groundwater levels are sufficiently low.

**West Kilworth Development Area**

The West Kilworth Development Area includes the proposed Edgewater Subdivision and the proposed Black Property Subdivision. Under existing conditions, runoff from this area travels southward as shallow surface flow to the Thames River.

Runoff from the future development will be conveyed to a proposed regional SWM facility located in the Edgewater Subdivision. The proposed regional SWM facility will provide all necessary stormwater treatment to the proposed Black Property Subdivision and the proposed Edgewater Subdivision runoff and will discharge to the Thames River.

**Jefferies Road Outlet**

Runoff from this catchment is conveyed by existing storm sewers and right-of-ways to an existing SWM pond. The pond, along with an upstream oil/grit separator, provides all necessary stormwater treatment to the runoff from the design service area.

**Kilworth Park Drive Outlet (Kilworth East)**

This catchment is comprised of large, older residential lots with many mature trees. Runoff from this catchment is conveyed by the local rural road cross sections, including existing concrete lined roadside ditches to the Thames River.

The Middlesex Soils Survey suggests that the local soils are primarily comprised of Caledon fine sandy loam. The permeability of this soil may provide opportunities to treat stormwater using infiltration methods.

**Blackburn Crescent Outlet**

This catchment is mainly comprised of single-family residential lots, though there is recently constructed some medium density development in the northern portion of the catchment. Minor flows from this catchment are collected by existing storm sewers and conveyed directly to the Thames River. Major flows are conveyed by the existing right-of-ways.

Significant flooding occurred within the Kilworth East catchment during the July 24, 2018 storm event. Right-of-ways in the Kilworth Heights Subdivision were flooded. Basedment flooding was reported by a resident on Baron Crescent. Furthermore, flooding and erosion were reported near the low point on Pioneer Drive, where an overland flow route located between two homes conveys major flows to the Thames River. A memorandum providing additional details on this highly localized storm is provided in Appendix E.

In addition to the severity of the storm event, our review indicated that the following factors likely contributed to the July 24th flooding event:

- Construction is ongoing in the Kilworth Heights Subdivision and some catchbasins are blocked with filter cloth for ESC. The filter cloth reduces the catchbasin inlet capacity, forcing stormwater to travel overland;
- The Kilworth Heights Subdivision was designed with an orifice to restrict flows.

Information was passed on to the developer in order to modify the design of SWM controls prior to assumption of the subdivision by the municipality in order to mitigate flooding impacts.

The Middlesex Soils Survey suggests that the local soils are primarily comprised of Caledon fine sandy loam. The permeability of this soil may provide opportunities to treat stormwater using infiltration methods.

Refer to Figure B2-8 in Appendix B.2 for the existing drainage overview of Kilworth.

### 3.4.9 Lobo

Drainage within the Lobo Settlement Area is provided by roadside ditches that convey surface flows to the upstream branches of the McKellar Drain, at the headwaters of Gold Creek. The portions of the drain within the Settlement Area are closed. Surface flooding was reported on the north side of Egremont Road in the western portion of the Settlement Area through the public consultation process.

Refer to Figure B2-9 in Appendix B.2 for the existing drainage overview of Lobo.

### 3.4.10 Melrose

Runoff from the Wynfield Subdivision located northeast of the Egremont Road/Vanneck Road intersection is collected and conveyed by local storm sewers that discharge to the D. Campbell Drainage Works. The existing storm sewers include several rear yard catchbasins to collect runoff from external drainage areas. Significant portions of the D. Campbell Drainage Works are located within single family residential lots, which may limit access for future maintenance.

An existing dry SWM pond provides peak flow control to the runoff from the existing Wynfield Subdivision. Based on the information presented in the available excerpts from the Wynfield Subdivision Design Brief, the existing pond is designed to attenuate the post-development 5-year peak discharge to the 2-year pre-development peak discharge. The available topographic information suggests that overflows from the pond are conveyed across downstream properties as shallow surface flow.

Runoff from properties that front on Vanneck Road and Egremont Road is generally conveyed to the downstream receivers by the existing roadside ditches.

Refer to Figure B2-10 in Appendix B.2 for the existing drainage overview of Melrose.

### 3.4.11 Poplar Hill/Coldstream

The Sydenham River runs through the Poplar Hill/Coldstream Settlement Area and is the ultimate stormwater receiver. The Campbell Crescent/Sydenham Drive subdivision and Ashely Lane are the only portions of the Settlement Area that are serviced by storm sewers. The northwest portion of Poplar Hill is serviced by the the Poplar Hill Villa Drain and the Luyten Barclay Drain. Runoff from the rest of the settlement area is conveyed as surface flow by shallow roadside ditches.

Site visit observations suggest that significant temporary surface ponding may occur at the low point on Ashley Lane and major flows from Currie Lane are conveyed across downstream private properties. Furthermore, temporary surface ponding on the south side of Ilderton Road west of Valleyview Elementary School has been observed by residents.

Several parcels within the Settlement Area may be developed in the future. These lands are currently agricultural and runoff is conveyed to the Sydenham River as shallow surface flow.

Refer to Figure B2-11 in Appendix B.2 for the existing drainage overview of Poplar/Hill Coldstream.

## 3.5 KEY ISSUES

A summary of the key issues within each catchment area is provided in the following table. Alternative solutions have been identified for catchment areas facing a number of key issues, and generally include the need to service future development areas. In some catchment areas, however, issues can be better addressed through maintenance and operations, and recommendations will be identified.

## Table 3-5 Key Issues Summary

| Catchment Area | Key Issue | | | | | Alternative Evaluation Required (Y/N) |
|---|---|---|---|---|---|---|
| | Surface Flooding Risk | Future Development Servicing | Existing Municipal Drains | Conveyance System Issues | Issues with Outlet Availability | |
| Arva – Built-Up Area | X | | X | | | N |
| Arva – Development Area | | X | | | | Y |
| Ballymote | | X | X | X | | Y |
| Birr | X | X | | X | | N |
| Bryanston | X | X | X | X | | N |
| Denfield | X | X | | X | | N |
| Ilderton Drain No. 1 | | X | X | X | | N |
| Ilderton Drain No. 2 | | X | X | | | Y |
| Ilderton Drain No. 3 | | X | X | X | | N |
| South Ilderton Development Area | | X | X | | | Y |
| Komoka Drain No. 1 | | X | X | | X | Y |
| Komoka Drain No. 2 | X | | X | | | N |
| Komoka Drain No. 3 | | X | X | | | Y |
| Valleyview Subdivision | | | | | | N |
| West Komoka Development Area | | X | | | | Y |
| Northeast Komoka Development Area | | X | | | X | Y |
| Kilworth Glendon Drive Area | | X | | | X | Y |
| West Kilworth Development Area | | X | | | | N |
| Jefferies Road Outlet | | X | X | | | N |
| Kilworth Park Drive Outlet (Kilworth East) | | X | | X | | Y |
| Blackburn Crescent Outlet | X | | X | | | N |
| Lobo | | X | | | X | N |
| Melrose | X | X | X | | | Y |
| Poplar Hill/Coldstream | X | X | X | X | | N |

Key issues in each catchment area will be addressed as follows:

### Arva Built-Up Area

Alternative development and evaluation is not recommended:

- Debris accumulation at the mill pond outlet and repairs to the outlet culvert should be addressed as ongoing maintenance issues;
- While the existing minor system is not designed in accordance with current municipal standards, it likely provides a reasonable level of service;
- The temporary ponding that may occur during severe storm events at the low points on local right-of-ways does not pose a significant risk to safety or property; and
- The Arva Drainage Works Municipal Drain should be abandoned in accordance with the provisions of the *Drainage Act*. Future maintenance should be funded by the municipal stormwater levy.

### Arva Development Area

Alternative development and evaluation is recommended:

- A SWM strategy is required to service future development;
- Need to identify SWM criteria for future development; and
- There are at least two neighboring properties within the Arva Development Area that could be serviced by a single regional SWM facility.

### Ballymote

Alternative development and evaluation is recommended:

- The capacity of the Ballymote East Drain is likely limited and is probably insufficient to service future development on Highbury Avenue;
- There are multiple drainage servicing strategies that could be considered to improve conveyance and service future development; and
- Need to formalize policy for municipal drains that service both urban and rural areas.

### Birr

Alternative development and evaluation is not recommended:

- The temporary ponding that may occur during severe storm events at the low points on local right-of-ways does not pose a significant risk to safety or property;
- Flooding complaints appear to be related to lot grading issues;
- Property information to be reviewed to confirm that the existing storm sewer outlets are located within a formal easement, to allow future maintenance;
- Need to identify SWM criteria for future development; and
- Future development is located on a single parcel. There are two potential outlets, including the existing roadside ditch and the existing Salisbury Drive storm sewer. The SWM strategy and outlet arrangement should be developed by the proponent at the site plan stage.

**Bryanston**

Alternative development and evaluation is not recommended:

- Flooding of future residential development on west side of Highbury can be mitigated by proposed grading;
- Future development can be serviced by ditch improvements on west side of Highbury Avenue;
- Existing ponding in roadside ditches is due to culvert sliplining performed by Middlesex County;
- Ditch ponding appear to be a nuisance issue that does not significantly affect the existing ditch capacities;
- Need to identify SWM criteria for future development; and
- Need to formalize policy for municipal drains that service both urban and rural areas.

**Denfield**

Alternative development and evaluation is not recommended:

- Flooding at existing DICB to be mitigated by cleaning out channel downstream of outlet;
- While the existing minor system is not designed in accordance with current municipal standards, it likely provides a reasonable level of service. No flooding complaints were identified through the public consultation; and
- Servicing strategy for future development has been developed by others through an approved plan of subdivision.

**Ilderton Drain No. 1**

Alternative development and evaluation is not recommended:

- Surface flooding complaints within the catchment appear to be due to lot grading issues or localized grading issues;
- Servicing strategy for future development has been developed by others;
- The municipal drains within the settlement area should be abandoned in accordance with the provisions of the *Drainage Act*. Future maintenance should be funded by the municipal stormwater levy.

**Ilderton Drain No. 2**

Alternative development and evaluation is recommended:

- Surface flooding complaint south of Heritage Place appears to be due to trail grading issues;
- A SWM strategy is required to manage the runoff from the Hyde Park Road right-of-way.

**Ilderton Drain No. 3**

Alternative development and evaluation is not recommended:

- The risk of surface flooding on Ilderton Road will likely be substantially reduced by future urbanization and installation of a municipal storm sewer in the right-of-way;
- Servicing strategy for future development has been developed;

- Existing municipal drain should be abandoned within the catchment limits as described in the Little Farm Subdivision SWM Report.

**South Ilderton Development Area**

Alternative development and evaluation is recommended:

- A SWM strategy is required to service future development;
- Need to identify SWM criteria for future development;
- The municipal drains within the settlement area should be abandoned in accordance with the provisions of the *Drainage Act*. It is assumed that the drains within the settlement area will be abandoned during future development activities.

**Komoka Drain No. 1**

Alternative development and evaluation is recommended:

- A SWM strategy is required to convey and treat the runoff from the proposed Glendon Drive Improvements and the future Tunks Lane developments to an appropriate outlet;
- Need to identify SWM criteria for future development;
- The municipal drains within the settlement area should be abandoned in accordance with the provisions of the *Drainage Act*. Future drain maintenance should be funded through the stormwater levy.

**Komoka Drain No. 2**

Alternative development and evaluation is not recommended:

- While the existing minor system is not designed in accordance with current municipal standards, it likely provides a reasonable level of service. No flooding complaints were identified through the public consultation;
- The temporary ponding that may occur during severe storm events at the low points on local right-of-ways does not pose a significant risk to safety or property;
- Komoka Drain No. 2 should be abandoned in accordance with the provisions of the *Drainage Act*. Future maintenance should be funded by the municipal stormwater levy;
- Need to formalize policy for municipal drains that service both urban and rural areas.

**Komoka Drain No. 3**

Alternative development and evaluation is recommended:

- A SWM strategy is required to convey and treat the runoff from the proposed development area to an appropriate outlet;
- The SWM strategy should consider the opportunity to treat runoff from existing development;
- The municipal drains within the settlement area should be abandoned in accordance with the provisions of the *Drainage Act*. Future drain maintenance should be funded through the stormwater levy.
- The possibility of the elimination of conservation measures north of CP line and return to active agricultural state in external drainage area should be considered in SWM strategy;
- Sensitive nature of receiving watercourse must be considered in SWM strategy.

**Valleyview Subdivision**

Alternative development and evaluation is not recommended:

- This is a recently constructed subdivision with a SWM pond and drainage servicing designed in accordance with current municipal standards.

**West Komoka Development Area**

Alternative development and evaluation is recommended:

- A SWM strategy is required to convey and treat the runoff from the proposed development area and proposed Glendon Drive Improvements;
- Should consider opportunities to treat runoff from Komoka Drain No. 2;
- Sensitive nature of receiving watercourse must be considered in SWM strategy;
- The municipal drains within the settlement area should be abandoned in accordance with the provisions of the *Drainage Act*. It is assumed that the drains within the settlement area will be abandoned during future development activities.

**Northeast Komoka Development Area**

Alternative development and evaluation is recommended:

- A SWM strategy is required to convey and treat the runoff from the proposed development area;
- Sensitive nature of receiving watercourse must be considered in SWM strategy;
- SWM strategy needs to consider that a significant portion of this area has no surface water outlet.

**Kilworth Glendon Drive Area**

Alternative development and evaluation is recommended:

- A SWM strategy is required to convey and treat the runoff from the proposed development area and the proposed Glendon Drive Improvements;
- Sensitive nature of receiving watercourse must be considered in SWM strategy;
- SWM strategy needs to consider that the existing surface water outlet may be inadequate to accommodate the runoff from future development.

**West Kilworth Development**

Alternative development and evaluation is not recommended:

- Servicing strategy for future development has been prepared by the development proponent.

**Jefferies Road outlet**

Alternative development and evaluation is not recommended:

- Conveyance of runoff from the existing subdivision provides and adequate level of service;
- Existing pond provides all necessary stormwater treatment;
- Doan Drain to be abandoned concurrent with proposed development;
- Potential for pond expansion to be reviewed in further detail.

**Kilworth Park Drive Outlet (Kilworth East)**

Alternative development and evaluation is recommended:

- Conveyance of runoff from the existing subdivision provides an adequate level of service;
- Need SWM strategy for future Glendon Drive improvements;
- Options to replace failing concrete-lined ditches to be evaluated.

**Blackburn Crescent Outlet**

Alternative development and evaluation is not recommended:

- Doan Drain south of Glendon Drive to be abandoned concurrent with proposed development;
- Existing SWM strategy within unassumed portions of Kilworth Heights Subdivision to be reviewed by the design engineer. Inspection should be undertaken to ensure proposed revisions have been addressed prior to the assumption of the subdivision by the Municipality;
- The storm event that resulted in basement flooding was more severe than the maximum design event;
- A major system outlet should be created along the Pioneer Drive overland flow route.

**Lobo**

Alternative development and evaluation is not recommended:

- Surface flooding complaint appears to be related to ditch capacity and should be addressed by operations and maintenance;
- Future development is located on individual parcels. The SWM strategy and outlet arrangement should be developed by the proponent at the site plan stage.

**Melrose**

Alternative development and evaluation is recommended:

- Overflows from existing SWM pond may present a flooding risk to downstream properties;
- Alignments of existing municipal drains will make access for future maintenance problematic;
- Recommend abandonment of municipal drains in urban areas and rely on stormwater charges to fund future maintenance;
- Need to formalize policy for municipal drains that service both urban and rural areas.

**Poplar Hill/Coldstream**

Alternative development and evaluation is not recommended:

- Flows from Currie Court should be managed by securing a drainage easement on the downstream property to protect the flow path and prevent construction of structures that could be damaged by surface flows;
- Future development is located on individual parcels. The SWM strategy and outlet arrangement should be developed by the proponent at the site plan stage;
- Local flooding at Valleyview Elementary School should be addressed by installing a culvert under Ilderton Road;

- The municipal drains within the settlement area should be abandoned in accordance with the provisions of the *Drainage Act*. Future drain maintenance would be funded through the municipal stormwater levy.
- Need to formalize policy for municipal drains that service both urban and rural areas.

# 4.0 PHASE 2: ALTERNATIVE SOLUTIONS

As part of the Class EA planning process, reasonable and feasible alternative solutions to the Phase 1 Problem and Opportunity Statement are identified and described in Phase 2. The magnitude of the net positive and negative effects of each alternative solution are identified and evaluated. Based on this evaluation, preliminary preferred option selected and confirmed based on public, agency and First Nations community consultation. The following sections describe the design criteria and alternative options developed for each drainage area to address the key issues.

## 4.1 STORMWATER DESIGN CRITERIA AND KEY OBJECTIVES

The following study objectives were developed to incorporate applicable design criteria (Municipality of Middlesex Centre Design Standards, Ministry of the Environment, Conservation and Parks Stormwater Management Planning and Design Manual 2003) in order to identify the ideal outcome for each of the key issues previously noted specific to the existing drainage systems. The objectives were used in the development of alternative solutions and will become part of the evaluation criteria discussed in Section 5.0, against which each alternative solution will be evaluated.

- **Surface Flooding** – The Master Plan should mitigate surface flooding that threatens property or public safety. The Middlesex Centre design standards state that maximum design ponding depths are 300 mm on roadways and 450 mm at rear yard catchbasins, respectively. These depths should be used as targets in the Master Plan.
- **Groundwater** – Homes where sump pumps run frequently were likely designed without adequate consideration for the local groundwater elevations. Urban stormwater systems are typically designed to collect and convey surface runoff from rainfall events to mitigate the possibility of surface flooding. Collecting subsurface water to lower local groundwater elevations and reduce the use of residential sump pumps is not usually considered a responsibility of the municipality. Further detailed design phases may consider localized opportunities to mitigate high groundwater impacts where feasible; however, consideration for overall water balance and impact to receiving watercourses should be reviewed in conjunction with this assessment.
- **Future Development Servicing** – Areas of future development require adequate downstream storm drainage servicing to convey post-development runoff and to mitigate downstream flooding. The Master Plan should identify measures to control peak flows to pre-development magnitudes for all storms up to and including the 100-year event, consistent with the Municipality's design standards. Furthermore, opportunities to mitigate surface water problems in existing developed areas by providing additional capacity in the future storm infrastructure will be identified. Furthermore, future stormwater servicing infrastructure is to provide MECP 'Enhanced' level protection water quality control to the runoff from all new development.
- **Municipal Drains** – Drainage servicing in many areas is provided by municipal drains, established and maintained through the provisions of the *Drainage Act*. There are several problems associated with these systems; they are typically constructed to address drainage concerns in rural or agricultural areas, and thus typically have insufficient capacity to convey peak discharges within

developed areas. Additional complications include access for maintenance, and procuring funding for maintenance. The Master Plan should provide recommendations for instituting a consolidated and sustainable approach to the funding and maintenance of stormwater drainage within the Settlement Area.

- **Conveyance/Capacity** – In accordance with the Middlesex Centre design standards, all proposed minor storm drainage systems presented in the Master Plan should be designed to convey the peak runoff from 2-year design storm event and all proposed major storm drainage systems should be designed to convey the peak runoff from 100-year design storm event.
- **Outlet Availability** – Within a number of catchment areas throughout the Municipality, existing storm drainage outlets are not readily through municipally controlled lands. This presents a challenge particularly within areas of future development. Establishing new outlets must have regard for downstream capacity, sensitive habitats, and erosion and sedimentation.

Refer to Figures B3-1 to B3-11 in Appendix B for an overview of the alternative solutions considered for each catchment area.

## 4.2 ALTERNATIVE SOLUTIONS BY CATCHMENT AREAS

### 4.2.1 Arva Future Development Area

A SWM strategy to treat the runoff from the proposed development area is required. SWM measures within this catchment area must provide the following treatment:

- Provide Enhanced Protection Level water quality control to remove 80% of Total Suspended Solids (TSS) from stormwater. This treatment level is consistent with existing downstream SWM facilities that discharge to Medway Creek; and
- Attenuate the peak discharges from all design events up to and including the 100-year storm to pre-development magnitudes.

**Alternative 1 – Do Nothing**

In this alternative, runoff from future development is conveyed directly to Medway Creek without treatment. This alternative does not meet the target SWM control criteria.

**Alternative 2 – Regional SWM Facility**

A proposed regional SWM facility located on the south side of Medway Road provides water quality, water quantity, and erosion control to treat the runoff from all future development in the Arva Development Area. This location was selected because it has the lowest ground surface elevations within the catchment area and it is adjacent to Medway Creek. Since the proposed drainage area is greater than the minimum design area of 10 ha (MECP, 2003), the proposed SWM facility can be designed as a wet pond, providing all necessary water quality treatment, in addition to peak flow control. The proposed regional SWM facility will be operated and maintained by the Municipality of Middlesex Centre.

The proposed pond discharges to Medway Creek via a new outfall. Utilizing the existing Croydon Drive storm sewer outfall located south of the Arva Development Area was considered. However, this isn't feasible because the existing Croydon Drive inverts are too high to accommodate the minor system from the proposed development area.

Minor flows are conveyed to the proposed regional pond via proposed local storm sewers. Major flows are conveyed to the proposed regional SWM pond via proposed right-of-ways. A proposed culvert conveys the major flows from the north side of Medway Road to the proposed regional pond.

**Alternative 3 – Local SWM Controls**

On-site SWM controls provide water quality, water quantity, and erosion control to treat the runoff from all future development. The proposed SWM controls provide at-source treatment to the runoff from the proposed development areas and may include:

- Soakaway pits and/or bioswales to capture and infiltrate rooftop runoff;
- Roadside ditches to provide water quality treatment and convey runoff from the proposed right-of-ways;
- Underground storage to provide peak flow attenuation;
- Permeable pavement on private roadways; and
- Dry SWM ponds to provide peak flow attenuation during severe design events.

The developer's engineer will be responsible for selecting the at-source SWM control measures to treat the runoff from the future development concept. The measures must be designed to meet the post-development SWM control requirements and must be accepted by MOMC.

Two separate outfalls are required to convey the treated runoff to Medway Creek – one on the north side of Medway Road, and one on the south side.

### 4.2.2 Ballymote

Future development within this Settlement Area will likely be limited to a few single-family residential lots fronting on the existing Highbury Avenue and Medway Road right-of-ways. The most significant drainage concerns are that:

- The existing Ballymote East Drain does not have sufficient capacity to provide a sufficient level of service to both existing and future development; and
- Portions of the Highbury Armitage Drain bisect the future development area located on the western side of the Ballymote Settlement Area.

**Alternative 1 – Do Nothing**

In this alternative, runoff from future development located along Highbury Avenue travels to the local municipal drains without peak flow control or treatment. Development cannot proceed along Medway Road due to the alignment of the existing municipal drains.

**Alternative 2 – On-Site SWM Controls**

Implement mitigation measures on future development to reduce the peak discharges from future development that contributes runoff to the Ballymote East Drain to existing conditions magnitudes. Potential mitigation measures may include lot-level controls such as soakaway pits to capture rooftop runoff or permeable pavements on driveways. Based on preliminary hydrologic calculation results, a design runoff retention target of 25 mm reduces the 100-year post-development runoff volumes to pre-development magnitudes. The existing overland flow route along the Ballymote East Municipal Drain must be maintained.

All municipal drains located within the proposed development areas are realigned along the property boundaries to facilitate residential development. Realignment is performed in accordance with the provisions of the *Drainage Act* and is initiated by the development proponent.

**Alternative 3 – Replace Drain with Storm Sewer Located in Easement**

The existing 200 mm Ballymote East Drain is replaced with a proposed 450 mm diameter storm sewer located in a proposed drainage easement. The proposed storm sewer discharges to the Ballymote North Drain and major flows continue to follow the existing topography along the drainage easement. A dry SWM pond located at the proposed storm sewer outlet provides peak flow control and water quality treatment. The existing overland flow route from the Highbury Avenue right-of-way must be maintained.

A new perforated pipe located in the proposed storm sewer trench mimics the existing subsurface drainage and provides an outlet to any existing field tiles connected directly to the existing Ballymote East Drain.

The municipal drain located in the west proposed development area is realigned within the Medway Road right-of-way to facilitate residential development. Realignment is performed in accordance with the provisions of the *Drainage Act* and is initiated by the development proponent.

**Alternative 4 – Replace Drain with Storm Sewer Located in Medway Road**

A new proposed storm sewer located in the existing right-of-ways conveys the runoff from the area currently serviced by the Ballymote East Drain to a proposed dry SWM pond that provides peak flow control and Basic Protection Level water quality treatment. This option provides an opportunity to urbanize portions of the Highbury Avenue and Medway Road right-of-ways.

The municipal drain located in the west proposed development area is realigned within the Medway Road right-of-way to facilitate residential development. The Ballymote East Drain is realigned around the Ballymote Settlement Area and continues to provide drainage servicing to the existing agricultural lands. Realignment is performed in accordance with the provisions of the *Drainage Act* and is initiated by the development proponent.

### 4.2.3 Ilderton

#### 4.2.3.1 Ilderton Drain No. 2

The Hyde Park Road right-of-way south of Ilderton Road is serviced by fragmented municipal drains located in residential rear yards, which present the following challenges:

- The municipal drain alignments make access for future maintenance problematic, as the drains cross multiple private properties and obstructions such as fences and trees may need to be removed;
- While the MOMC has the authority to enter properties to perform municipal drain maintenance, landowners may be unaware of the presence of a municipal drain on their properties and could construct obstructions on top of drainage systems that may cause damage or prevent access for future maintenance; and
- The drains were originally designed to provide agricultural drainage. As the service area is now fully urbanized, the capacities of these drains are likely insufficient to provide adequate conveyance during significant storm events.

Furthermore, there are opportunities to improve the performance of the Van Bussell Agreement Drain and to mitigate asphalt deterioration in the Meadowcreek Subdivision caused by sump pump discharges to the ground surface.

**Alternative 1 – Do Nothing**

Fragmented municipal drains continue to convey runoff from the Hyde Park Road right-of-way to the downstream subdivision. Flooding continues along the Van Bussell Agreement Drain near the Hyde Park Road low point.

**Alternative 2 – Drain Improvements**

This alternative is consistent with MOMCs planned improvements to the Van Bussell Agreement Drain. The existing 400 mm diameter concrete pipe that conveys stormwater is replaced with a 600 mm diameter PVC pipe to provide additional conveyance from the Hyde Park Road low point and to mitigate local flooding. The 600 mm diameter pipe discharges to the existing downstream storm sewer. It is noted that subsequent to finalizing the Master Plan Report, this concrete pipe has been replaced as planned. When the Hyde Park Road right-of-way is urbanized in the future, the existing municipal drains are abandoned and replaced with a proposed storm sewer that discharges to the proposed 600 mm diameter pipe.

**Alternative 3 – SWM Pond**

The existing municipal drains that service the Hyde Park Road right-of-way are abandoned and replaced with a proposed storm sewer designed in accordance with current MOMC standards. The Van Bussell Agreement Drain is removed, and the proposed storm sewer conveys runoff to a proposed dry SWM pond located on the east side of Hyde Park Road that attenuates the peak flows to the capacity of the existing downstream storm sewer. Based on the available topographic information, the maximum

allowable facility footprint is approximately 0.3 ha, which results in an approximately 2,400 $m^3$ maximum design storage volume. Pretreatment is provided upstream of the proposed dry SWM pond by catchbasin inserts to remove suspended sediment. Preliminary hydrologic calculation results suggest that the proposed dry SWM pond has sufficient capacity to attenuate the peak discharges for all design events up to and including the 25-year storm.

**Alternative 4 – SWM Pond and Downstream Sewer Improvements**

In this alternative, the downstream storm sewers are upsized to provide more capacity to mitigate the risk of local flooding on Hyde Park Road. Furthermore, storm private drain connections (PDCs) are provided along the proposed storm sewer alignment to eliminate surface sump pump discharges.

Similar to Alternative 3, the existing municipal drains that service the Hyde Park Road right-of-way are abandoned and decommissioned. The Van Bussell Agreement Drain is removed, and the proposed storm sewer conveys runoff to a proposed dry SWM pond located on the east side of Hyde Park Road that attenuates the peak flows to the capacity of the existing downstream storm sewer. Based on the available topographic information, the maximum allowable facility footprint is approximately 0.3 ha, which results in an approximately 2,400 $m^3$ maximum design storage volume. Pretreatment is provided upstream of the proposed dry SWM pond by catchbasin inserts to remove suspended sediment. The improved downstream storm sewer is sized to accommodate the 100-year attenuated peak flow from the proposed dry SWM pond.

#### 4.2.3.2 South Ilderton Development Area

The Official Plan shows that future development in this catchment will be comprised of commercial and employment lands. Stormwater from future development within the South Ilderton Development Area must be managed to mitigate downstream flooding, erosion, and water quality impacts. SWM measures within this catchment area must provide the following treatment:

- Provide Enhanced Protection Level water quality control to remove 80% of TSS from stormwater. This treatment level is consistent with the Clear Skies Subdivision SWM pond, which also discharges to Oxbow Creek; and
- Attenuate the peak discharges from all design events up to and including the 100-year storm to pre-development magnitudes.

MOMC staff report that the Hughes Charlton Drain capacity is limited. Standing water is frequently observed south of 10 Mile Road for prolonged periods following heavy rain. Similarly, the capacity of the Oxbow Creek Drain is reportedly limited, with high water levels persisting after rainfall events. Consequently, the Hughes Charlton Drain is not a viable outlet for future development in the South Ilderton Development Area. Instead, all runoff should be discharged directly to the Oxbow Creek Drain, and the future drainage system must be designed to operate under high tailwater conditions.

**Alternative 1 – Do Nothing**

In this alternative, runoff from future development is conveyed directly to the Oxbow Creek Drain without stormwater treatment. This alternative does not meet the target SWM control criteria.

**Alternative 2 – Single SWM Facility**

A proposed regional SWM facility provides all necessary stormwater treatment to the runoff from the entire South Ilderton Development Area. The SWM facility is a wet pond that provides water quality, water quantity and erosion control to the proposed development runoff. A wet pond strategy was selected because it can provide all necessary stormwater treatment within a single facility without the need for upstream pretreatment.

Major flows are conveyed across Hyde Park Road by a proposed culvert and a storm drainage channel conveys the flows from the downstream side of the culvert to the proposed regional SWM pond. The proposed pond discharges to the downstream Oxbow Creek Drain, and the pond is designed with sufficient storage volume to mitigate the downstream impacts of the post-development flows. The portion of the Hughes Charlton Drain located within the Settlement Area is abandoned and replaced with proposed storm sewers.

**Alternative 3 – Two SWM Facilities**

Two proposed regional SWM facilities provide all necessary stormwater treatment to the runoff from the South Ilderton Development Area. SWM 1 provides all necessary treatment to the runoff from the west side of Hyde Park Road. The proposed SWM pond discharges to either a proposed trunk storm sewer or open channel that conveys the treated stormwater to the Oxbow Creek Drain. Similarly, SWM 2 provides all necessary treatment to the runoff from the east side of Hyde Park Road and discharges to the Oxbow Creek Drain. The portion of the Hughes Charlton Drain located within the Settlement Area is abandoned and replaced with proposed storm sewers.

**Alternative 4 – On-Site SWM Controls**

All runoff from each block is treated by on-site SWM controls, which may include LID measures where soil conditions permit. A proposed local storm sewer collects and conveys the treated runoff to the Oxbow Creek Drain. Runoff from the proposed right-of-ways is treated by LID measures located in the proposed boulevards or on municipally owned lands. The portion of the Hughes Charlton Drain located within the Settlement Area is abandoned and replaced with proposed storm sewers.

### 4.2.4 Komoka/Kilworth

#### 4.2.4.1 Komoka Drain No. 1

Runoff from Komoka Drain No. 1 and Tunks Drain is discharged to privately owned ponds located south of Glendon Drive. The existing ponds are former gravel pits. The pond located on the east side of

Komoka Road has a culvert that outlets to the neighbouring Komoka Provincial Park pond[1]. However, the culvert is currently blocked, and an overland flow route has formed that conveys the pond overflows southward.

Except for one known surface water outlet structure that controls flow from one pond to a neighbouring property, the ponds on the west side of Komoka Road are likely hydrologically connected by subsurface flow only.

A stormwater management strategy is required to treat the runoff from future development near Tunks Lane and the proposed Glendon Drive improvements identified in the Glendon Drive Streetscape EA. SWM measures within this catchment area must provide the following treatment:

- Provide Enhanced Protection Level water quality control to remove 80% of TSS from stormwater. This protection level was selected based on the guidance presented in the Stormwater Management Planning and Design Manual (MECP, 2003); and
- Attenuate the peak discharges from all design events up to and including the 100-year storm to pre-development magnitudes.

The following issues within the catchment were identified and used to guide alternative development for this drainage area:

- Approximately 16 ha of future medium density residential and commercial development is located near Tunks Lane. While there is sufficient area to consider servicing future development with a regional SWM facility, providing stormwater treatment using on-site SWM controls will likely provide more flexibility to future development proposals.
- Komoka Drain No. 1 was not designed in accordance with current MOMC storm sewer design standards. However, based on information provided by municipal staff, there have been no historical concerns regarding the drain capacity or the level of service within its drainage area. The drain outfall is perched above the receiving pond water surface elevation, so the drain capacity is unlikely to be influenced by downstream tailwater elevations.
- The owner of a pond that receives stormwater from Komoka Drain No. 1 has communicated concerns with the quantity and quality of surface water entering his pond, noting that water levels have gradually risen in the pond over the past 20 years and that a fish kill occurred during spring 2018. While it is possible that the municipal drain outfall could have contributed to rising water levels and the observed fish kill, there are likely many factors that led to these problems. For instance, the pond is a former gravel pit and the rising water levels could be caused by local groundwater elevations gradually reaching equilibrium following cessation of gravel extraction and the fish kill could be caused by eutrophication. Similarly, the owner of the pond that provides the outlet to Tunks Drain noted concerns with receiving water from the municipal drain, though didn't identify any specific existing problems.
- With the exception of one control structure installed by the pond owner, the existing ponds located southwest of Glendon Drive to not have surface water outlets. While establishing a surface water

[1] Ontario Parks, Personal Communication (November 2018).

outlet to the Thames River would limit the maximum design water surface elevation in a proposed SWM facility with certainty, treating stormwater in a facility without a surface water outlet may be feasible. For example, the existing Prince Street Subdivision SWM pond located north of Glendon Drive does not have a surface water outlet and discharges solely via infiltration.

**Komoka Drain No. 1 – Potential Pond Locations**

There are several potential SWM pond locations that could treat the runoff from the drainage catchment. The first factor that was considered was whether a new pond should be constructed, or whether an existing pond should be modified to provide stormwater treatment.

A new SWM facility can be sized and constructed to provide the necessary stormwater treatment to the catchment runoff. There are few potential undeveloped locations near the Komoka Road Glendon Drive right-of-way.

Significant portions of Komoka Settlement Area are comprised of existing private ponds created from historical aggregate extraction operations. Modifying or repurposing an existing pond to provide stormwater treatment would take advantage of existing features that have little future development potential and potentially reduce construction costs by substantially reducing excavation requirements. However, the following concerns were identified for this strategy:

- Constructability may prove challenging, as temporary dewatering may be required to construct the berms necessary to isolate a proposed SWM facility from the rest of the pond;
- Providing a surface water outlet from a proposed pond may prove challenging, since the existing pond water levels are substantially lower than the Komoka Road ditch elevations;
- If no surface water outlet is provided from a proposed pond, long term water level monitoring will likely need to be performed to record annual water level fluctuations;
- If no surface water outlet is provided from a proposed pond, the upstream catchment should provide stormwater pretreatment to reduce the amount of TSS entering the facility and mitigate the risk of accumulated sediment reducing infiltration rates; and
- A new trunk watermain was recently installed on the west side of Komoka Road, which may present a significant obstruction to a proposed storm sewer discharging to an existing pond on the west side of Komoka Road.

Six potential SWM facility locations were identified, as shown in Figure 4.2.1. A brief screening exercise was performed to identify the most feasible pond locations, as follows:

**Location 1** – Komoka Drain No. 1 currently outlets to this private pond. A private SWM facility provides stormwater treatment to the runoff from the existing development located along the south side of Glendon Drive west of Komoka Road and discharges to this pond. Water levels in this pond have been previously raised due to construction of a berm on the neighbouring downstream property. The pond is connected via surface flows to the neighbouring pond and the neighbouring pond owner has noted that high water levels during the spring approach his residence. This pond was considered as a potential location for a SWM facility.

**Location 2** – The existing privately-owned ponds on this property are connected via culverts and gravel extraction is ongoing. There is no known surface water discharge from the downstream pond to the Thames River. Given the active gravel extraction on this property, these ponds were eliminated from consideration as a potential SWM facilities.

**Location 3** – The Tunks Lane Drain currently outlets to this private pond. There is no available bathymetric information for this pond, but available aerial photography suggests that it is likely relatively deep. The pond depth may make berm construction problematic, due to the amount of material required and the corresponding dewatering requirements. Since both the area and depth are much larger than necessary for SWM servicing purposes, this pond was eliminated from consideration as a potential SWM facility.

**Location 4** – This pond is located on private property and is directly connected to the neighbouring pond located in Komoka Provincial Park by a 400 mm diameter submerged culvert. The available topographic information suggests that the typical water levels in this pond are substantially lower than the neighbouring residence. This pond was considered as a potential location for a SWM facility.

**Location 5** – A proposed pond could be constructed on the east side of Komoka Road on municipally owned land at the existing WWTP. The Imperial Oil pipeline easement may obstruct the drainage infrastructure required to convey stormwater to the pond. Furthermore, a new booster pumping station may limit the available footprint for a proposed pond. This location was eliminated from consideration as a potential SWM facility.

**Location 6** – The Komoka Provincial Park pond discharges directly to the Thames River via an existing outlet structure. Recent beaver activity has plugged the outlet structure and resulted in elevated water levels in the pond. Modifications to the outlet structure are planned to reduce and manage water levels. Furthermore, Ontario Parks is considering lining the existing CSP outlet pipe. This pond was considered as a potential location for a SWM outlet.

**Alternative 1 – Do Nothing**

Komoka Drain No. 1 continues to discharge to the existing pond network on the west side of Komoka Road. Runoff from the Tunks Lane Drain continues to discharge to the existing pond on east side of Komoka Road. This alternative does not provide the necessary drainage infrastructure or SWM controls to manage the runoff from the proposed Glendon Drive improvements and does not mitigate potential negative impacts on downstream private ponds.

**Alternative 2 –SWM Pond Location 4 with Thames River Outlet**

The proposed Glendon Drive storm sewer collects the runoff from the future streetscape improvements, Komoka Drain No. 1, and the Tunks Lane Drain. Runoff from the Tunks Lane future development is treated by on-site SWM controls that discharge to the proposed Glendon Drive storm sewer. Both major and minor untreated flows are conveyed southward to a proposed SWM pond at Location 4, which provides both water quality treatment and peak flow control. The proposed pond discharges via a

proposed outlet structure to the neighboring downstream Komoka Provincial Park pond. Stormwater is conveyed to the Thames River by the existing pond outlet structure.

The proposed conveyance on Komoka Road will likely consist of a combination of culverts and ditches and will provide sufficient capacity to convey the peak major flow.

The existing pond at Location 4 is privately owned and would need to be acquired by the municipality.

**Alternative 3 –Pond Location 1 with Komoka Road Outlet**

The proposed Glendon Drive storm sewer collects the runoff from the future streetscape improvements, Komoka Drain No. 1, and the Tunks Lane Drain. Runoff from the Tunks Lane future development is treated by on-site SWM controls that discharge to the proposed Glendon Drive storm sewer. Both major and minor untreated flows are conveyed southward to a proposed SWM pond at Location 1, which provides both water quality treatment and peak flow control. The proposed pond discharges to a proposed outlet storm sewer on Glendon Drive that conveys the treated flows southward to the Thames River. The proposed storm sewer must cross the existing oil and natural gas pipeline easements and a new outfall to the Thames River must be constructed.

**Alternative 4 –Pond Location 1 with Municipal Drain Outlet**

The proposed Glendon Drive storm sewer collects the runoff from the future streetscape improvements, Komoka Drain No. 1, and the Tunks Lane Drain. Runoff from the Tunks Lane future development is treated by on-site SWM controls that discharge to the proposed Glendon Drive storm sewer. Both major and minor untreated flows are conveyed southward to a proposed SWM pond at Location 1, which provides both water quality treatment and peak flow control. The proposed pond discharges to a new municipal drain comprised of a series of proposed culverts that would link the downstream privately-owned ponds. The proposed culverts would be constructed in accordance with the *Drainage Act* and the downstream ponds would remain in private ownership. The proposed culverts must cross the existing oil and natural gas pipeline easements and a new outfall to the Thames River must be constructed. Periodic inspection of the proposed culverts would be required to verify that they are free of accumulated debris.

**Alternative 5 – Pond Location 6 with Thames River Outlet**

The proposed Glendon Drive storm sewer collects the runoff from the future streetscape improvements, Komoka Drain No. 1, and the Tunks Lane Drain. Runoff from the Tunks Lane future development is treated by on-site SWM controls that discharge to the proposed Glendon Drive storm sewer. Both major and minor flows are conveyed southward on Komoka Road to the existing Komoka Provincial Park pond. Water quality treatment is provided upstream of the pond outfall by a proposed treatment train. Stormwater is conveyed to the Thames River by the existing park pond outlet.

**Alternative 6 – Combine Alternatives 3 and 5**

The proposed Glendon Drive storm sewer collects the runoff from the future streetscape improvements, Komoka Drain No. 1, and the Tunks Lane Drain. Runoff from the Tunks Lane future development is treated by on-site SWM controls that discharge to the proposed Glendon Drive storm sewer. Both major

and minor untreated flows are conveyed southward to a proposed SWM pond at Location 1, which provides both water quality treatment and peak flow control. The proposed pond discharges to a proposed outlet storm sewer on Glendon Drive that conveys the treated flows southward to the Komoka Provincial Park pond. The proposed storm sewer must cross the existing oil pipeline easement. Stormwater is conveyed to the Thames River by the existing park pond outlet.

#### 4.2.4.2 Komoka Drain No. 3

This catchment drains to Komoka Creek, which is a sensitive coldwater fishery. A stormwater management strategy is required to treat the runoff from future development located west of Komoka Road. SWM measures within this catchment must provide the following treatment:

- Provide Enhanced Protection Level water quality control to remove 80% of TSS from stormwater;
- Attenuate the peak discharges from all design events up to and including the 100-year storm to pre-development magnitudes; and
- Incorporate temperature mitigation measures to protect the Komoka Creek coldwater fishery.

There are opportunities to provide stormwater treatment to the runoff from existing development located east of Komoka Road, which currently discharges untreated runoff to Komoka Creek, and to improve conveyance of surface flows from the large external drainage area located north of the existing railway.

Frank Drain was originally constructed to provide agricultural drainage, and the corresponding drain report suggests that its capacity is limited. Furthermore, the Union Avenue Branch Drain report suggests that the Frank Drain has not been maintained. Consequently, utilizing the drain to service future development is not feasible.

**Alternative 1 – Do Nothing**

In this alternative, runoff from the proposed development west of Komoka Road is conveyed by Komoka Drain No. 3 to Komoka Creek without treatment. Runoff from the Union Avenue Branch Drain is collected and conveyed to Komoka Drain No. 3 by a proposed local storm sewer. This alternative does not meet the target SWM control criteria.

**Alternative 2 – Service Only Proposed Development**

A proposed SWM facility provides all necessary stormwater treatment to the runoff from the proposed development west of Komoka Road. The proposed SWM facility must incorporate temperature mitigation measures to reduce the potential impacts of the proposed facility on Komoka Creek. Treated flows from frequent storm events are discharged to the existing Komoka Drain No. 3, based on the available drain capacity. Treated flows from severe storm events are discharged to the existing overland flow route that conveys them through the existing downstream CP Rail culvert.

Overflows from the upstream external drainage areas are conveyed around the perimeter of the proposed development by a proposed bypass swale.

**Alternative 3 – Service Both Existing and Proposed Development**

A proposed SWM facility provides all necessary stormwater treatment to the runoff from both the proposed development west of Komoka Road and the existing development located east of Komoka Road. The proposed SWM facility must incorporate temperature mitigation measures to reduce the potential impacts of the proposed facility on Komoka Creek. Treated flows from frequent storm events are discharged to the existing Komoka Drain No. 3, based on the available drain capacity. Treated flows from severe storm events are discharged to the existing overland flow route that conveys them through the existing downstream CP Rail culvert.

Overflows from the upstream external drainage areas are conveyed around the perimeter of the proposed development by a proposed bypass swale.

#### 4.2.4.3 West Komoka Development Area

Runoff from this future development area travels as shallow surface flow to Komoka Creek, which is a sensitive coldwater fishery. A stormwater management strategy is required to treat the runoff from future development in accordance with the following SWM criteria:

- Provide Enhanced Protection Level water quality control to remove 80% of TSS from stormwater;
- Attenuate the peak discharges from all design events up to and including the 100-year storm to pre-development magnitudes; and
- Incorporate temperature mitigation measures to protect the Komoka Creek coldwater fishery.

There is an opportunity to provide stormwater treatment to the runoff from both the future Glendon Drive improvements and existing development conveyed by Komoka Drain No. 2, which currently discharges untreated runoff to Komoka Creek.

The existing outlet for the western portion of the catchment is the existing Glendon Drive culvert, and the upstream topography is relatively flat. Using the Drainage Act to construct a new outlet to convey stormwater from the downstream side of the Glendon Drive culvert to Komoka Creek was considered. However, the UTRCA noted that this outlet strategy could exacerbate existing erosion concerns on the downstream properties.

**Alternative 1 – Do Nothing**

In this alternative, runoff from future development in the West Komoka Development Area is conveyed directly to Komoka Creek without treatment. This alternative does not meet the SWM control targets for this area.

**Alternative 2 –Service Only Proposed Development**

Both SWM 1 and SWM 2 provide all necessary stormwater treatment to the runoff from the proposed development area. Both SWM facilities include a significant infiltration storage component to provide temperature impact mitigation. Pretreatment is provided upstream of both proposed SWM facilities to reduce suspended sediment loading and to mitigate water quality concerns. Salt management plans are

required to reduce the possibility of road salt entering the proposed SWM facilities. Both proposed SWM facilities include piped overflows to Komoka Creek to convey stormwater during severe storm events. Runoff from Komoka Drain No. 2 continues to discharge to Komoka Creek without treatment. Runoff from the proposed Glendon Drive improvements is treated by enhanced roadside ditches, in accordance with the preliminary SWM strategy presented in the Glendon Drive Streetscape EA.

**Alternative 3 – Service Both Proposed and Existing Development**

The drainage system for the proposed development located east of Komoka Creek provides sufficient capacity to accommodate the runoff from Komoka Drain No. 2 and the Glendon Drive improvements. SWM 1 provides all necessary stormwater treatment to the runoff from the proposed development east of Komoka Creek, Komoka Drain No. 2, and the adjacent Glendon Drive improvements. Similarly, SWM 2 provides all necessary stormwater treatment to the runoff from the proposed development west of Komoka Creek and the adjacent Glendon Drive improvements. Both SWM facilities include a significant infiltration storage component to provide temperature impact mitigation. Pretreatment is provided upstream of both proposed SWM facilities to reduce suspended sediment loading and to mitigate water quality concerns. Salt management plans are required to reduce the possibility of road salt entering the proposed SWM facilities. Both proposed SWM facilities include piped overflows to Komoka Creek to convey stormwater during severe storm events.

#### 4.2.4.4 Northeast Komoka Development Area

A stormwater management strategy is required to control the runoff from future development and to protect potential coldwater habitat in Oxbow Creek. The proposed SWM strategy must treat the runoff from future development in accordance with the following SWM criteria:

- Provide Enhanced Protection Level water quality control to remove 80% of TSS from stormwater;
- Attenuate the peak discharges from all design events up to and including the 100-year storm to pre-development magnitudes; and
- Incorporate temperature mitigation measures to protect the Oxbow Creek cold water fishery.

The western portion of the catchment is a former gravel pit with no existing surface water outlet and a development proposal is actively underway. There are no known active development applications for the eastern portion of the catchment.

**Alternative 1 – Do Nothing**

In this alternative, runoff from the proposed Northeast Komoka Development Area travels to the existing gravel pit and Oxbow Creek without treatment. This alternative does not meet the SWM control targets for this area.

**Alternative 2 – Two SWM Facilities with Surface Water Outlet to Oxbow Creek**

Stormwater from the western portion of the catchment receives pretreatment to remove suspended sediment and is discharged to a proposed SWM pond (SWM 2) that outlets primarily by infiltration. A

proposed trunk storm sewer conveys overflows from SWM 2 eastward to Oxbow Creek. A detailed hydrogeological assessment is required to establish the proposed pond typical water level ranges and to estimate infiltration rates.

SWM 1 provides water quality treatment and peak flow control to the runoff from the eastern portion of the catchment area. An OGS or other water quality treatment measure is required upstream of SWM 1 to meet the design water quality treatment criteria. SWM 1 is designed as a dry pond to mitigate temperature impacts on Oxbow Creek. The proposed pond discharges to the proposed trunk storm sewer.

The proposed trunk storm sewer mitigates concerns regarding the ability of SWM 2 to discharge via infiltration and provides certainty to the maximum design water levels. Construction of the outlet storm sewer eastward to Oxbow Creek presents challenges from a construction timing perspective. There is an active development application on the western portion of the site, however the storm sewer alignment runs through privately held land to the east for which there is no active development interest. While the necessary corridor could be acquired by the Municipality to accommodate the proposed multi-use trail connection shown within the Official Plan (Land Use Schedule A-2), there are no current plans to do so.

**Alternative 3 – Two SWM Facilities**

Stormwater from the western portion of the catchment receives pretreatment to remove suspended sediment and is discharged to a proposed SWM pond (SWM 2). SWM 2 detains the stormwater and gradually releases it via infiltration and evapotranspiration. The proposed pond is designed with sufficient active storage to accommodate the 250-year runoff volume and additional contingency storage volume to mitigate concerns regarding potential long-term reduction in infiltration rates. An emergency overflow at the top of the contingency active storage volume directs flows westward towards the neighboring municipal park. A detailed hydrogeological assessment is required to establish the proposed pond typical water level ranges and to estimate infiltration rates. Additionally, long-tem post-construction monitoring of the pond performance will be required. If monitoring suggests that the pond does not provide sufficient infiltration capacity to manage the contributing runoff, a piped overflow will be constructed to convey runoff eastward to Oxbow Creek.

Stormwater from the eastern portion of the catchment is conveyed to SWM 1, which provides water quality treatment and peak flow control. An OGS or other water quality treatment measure is required upstream of SWM 1 to meet the design water quality treatment criteria. SWM 1 discharges to Oxbow Creek and is designed as a dry pond to mitigate temperature impacts.

#### 4.2.4.5 Kilworth Glendon Drive Area

Runoff from this future development area travels as shallow surface flow to Oxbow Creek, which provides potential coldwater habitat. A stormwater management strategy is required to treat the runoff from future development in accordance with the following SWM criteria:

- Provide Enhanced Protection Level water quality control to remove 80% of TSS from stormwater;

- Attenuate the peak discharges from all design events up to and including the 100-year storm to pre-development magnitudes; and
- Incorporate temperature mitigation measures to protect the Oxbow Creek potential coldwater conditions.

The existing drainage route from this catchment to Oxbow Creek is a shallow swale. Consequently, establishing an outlet to accommodate future storm sewers within this catchment may prove challenging.

The proposed stormwater management strategy must also address the runoff from the adjacent Glendon Drive improvements. The Glendon Drive Streetscape EA identifies the following three potential outlets for this portion of the proposed corridor:

1. Oxbow Creek;
2. The existing Kilworth Subdivision; and
3. The proposed Kilworth Heights West Subdivision.

The Kilworth Heights West Subdivision Functional SWM Report (Eng Plus, 2017) suggests that runoff from the eastern portion of the proposed subdivision will consume the available storm sewer capacity in the existing Kilworth Subdivision. Consequently, discharging the runoff from the Kilworth Glendon Drive Area to the existing Kilworth Subdivision is no longer a viable option.

A review of the accepted Kilworth Heights West Subdivision design drawings shows that the Crestview Drive storm sewer, currently under construction, is too high to provide an outlet for the proposed development located north of Glendon Drive.

**Alternative 1 Do Nothing**

In this alternative, minor flows from proposed development are collected by a proposed storm sewer that discharges to the Oxbow Creek tributary without treatment. Major flows from the western portion of the catchment travel uncontrolled towards Tunks Lane and major flows from the eastern portion of the catchment travel uncontrolled towards the Oxbow Creek tributary. This alternative does not meet the SWM control targets for this area.

**Alternative 2 – Discharge to Oxbow Creek**

Minor flows from both the proposed development area and the Glendon Drive improvements are collected by proposed trunk storm sewers that discharge to proposed SWM 1 located north of Glendon Drive. Major flows from the eastern portion of the catchment are also conveyed to SWM 1, which discharges to the Oxbow Creek tributary, similar to existing conditions. SWM 1 provides all necessary stormwater treatment to the runoff from the design service area. Given the local sandy soils, LID measures to capture and retain runoff near its source are likely a feasible strategy for reducing the peak minor system flows and the SWM 1 design storage volumes.

The ground surface elevations in the western portion of the catchment are too low to be serviced by SWM 1. Consequently, all stormwater treatment for this area is provided by on-site SWM controls. A drainage easement conveys stormwater westward to a proposed local storm sewer on Tunks Lane.

**Alternative 3 – Discharge to Glendon Drive Trunk Storm Sewer**

Minor flows from the proposed Glendon Drive improvements are collected and conveyed westward by a proposed trunk storm sewer. Major flows from Glendon Drive are conveyed to Oxbow Creek by the existing overland drainage route.

Minor flows from the proposed development area are collected and conveyed westward by a proposed storm sewer that discharges to SWM 1. Major flows are conveyed by the future right-of-ways to SWM 1. SWM 1 provides all necessary stormwater treatment to the runoff from the design service area. Given the local sandy soils, LID measures to capture and retain runoff near its source are likely a feasible strategy for reducing the peak minor system flows and the SWM1 design storage volumes.

The treated flows from SWM 1 are discharged to a proposed local storm sewer on Tunks Lane that conveys them the proposed Glendon Drive trunk storm sewer. A drainage easement conveys stormwater westward to a proposed local storm sewer on Tunks Lane.

### 4.2.4.6 Kilworth East (Kilworth Park Drive Outlet)

Alternative solutions were developed to address the following drainage concerns in the Kilworth Park Drive Outlet catchment:

- Deterioration of concrete lined ditches in eastern portion of the catchment; and
- Finalize the drainage strategy for the proposed Glendon Drive improvements.

A preliminary stormwater strategy for the proposed Glendon Drive improvements was presented in the Glendon Drive Streetscape EA. However, since runoff from the existing development is not formally treated, and the existing concrete lined roadside ditches are deteriorating, opportunities to convey and treat the runoff from both Glendon Drive and the existing development area were considered.

**Alternative 1 – Do Nothing**

In this alternative, the runoff from the proposed Glendon Drive improvements is conveyed to the Thames River without treatment. The existing concrete lined ditches will continue to deteriorate, resulting in localized erosion. This alternative is not consistent with the recommendations of the Glendon Drive Streetscape EA.

**Alternative 2 – SWM Strategy per Glendon Drive EA**

All runoff from the Glendon Drive improvements is collected and treated by a proposed enhanced grass swale located on the north side of the Glendon Drive right-of-way. The proposed enhanced grassed swale conveys the runoff eastward to the Thames River and provides both water quality and quantity treatment.

The existing concrete lined ditches in the Kilworth Subdivision are maintained and repaired as needed.

**Alternative 3 – Grassed Ditches to Provide Treatment**

Runoff from the proposed Glendon Drive improvements is collected and conveyed through Kilworth East to the existing Kilworth Drive Outlet. Any runoff that cannot be directed through Kilworth East will travel eastward to the Thames River and will be treated by a proposed enhanced grass swale that provides both water quality and quantity treatment.

The existing Kilworth East roadside ditches are replaced with widened grassed bottom ditches to accommodate the additional runoff from the Glendon Drive improvements, provide water quality treatment and attenuate the proposed peak discharges to pre-development magnitudes. Concrete is removed and the ditches are regraded and seeded. The proposed ditches are significantly wider than the existing concrete lined ditches to provide sufficient capacity to convey the peak flows and a stable cross section that mitigates erosion. The proposed ditches may encroach beyond property lines and result in tree removals. Periodic grass mowing is required to maintain the ditches.

### 4.2.5 Melrose

Existing municipal drains within the Melrose Settlement Area collect and convey runoff from rear yards across neighboring properties to the local outfalls. The portions of the municipal drains within the urban area present the following challenges:

- The municipal drain alignments make access for future maintenance problematic, as the drains cross multiple private properties. Obstructions such as fences and trees may need to be removed;
- While the drains are located within working easements, landowners may be unaware of the easement limits and could construct obstructions on top of the municipal drains that may damage the drainage system or prevent access for future maintenance. The available aerial photography suggests that portions of the municipal drains may be located under existing structures; and
- Damage to the municipal drains could affect all upstream properties.

The Municipality noted that there have been previous rear yard drainage problems caused by the poor condition of the pipes located in the rear yards.

**Alternative 1 – Do Nothing**

Minor flows continue to be conveyed by municipal drains located on private properties. Fences, landscaping and sheds will obstruct future drain maintenance. Future damage to the municipal drains could be caused by homeowner construction projects, such as fence post installation. Existing rear yard drainage problems will continue.

**Alternative 2 – Relocate Drainage System**

The runoff from each inlet is routed directly to the local storm sewers located in the municipal right-of-ways via proposed storm laterals located parallel to existing property lines. The proposed storm laterals will provide better access to the rear yard drainage system and will be offset from property lines. Since each lateral services fewer properties than the existing municipal drains, flood risks caused by damage to

the rear yard drainage system are reduced. The proposed laterals are located in drainage easements to be obtained by the Municipality. Future maintenance will be the responsibility of the Municipality.

### 4.2.6 Remaining Settlement Areas

Note that alternative solutions were not identified for the following catchment areas based on the screening of Key Issues found in 3.5 (See Section 6.12 for recommendations for these catchment areas):

- Arva – Built Up Area
- Birr
- Bryanston
- Denfield
- Ilderton Drain No. 1
- Ilderton Drain No. 3
- Komoka Drain No. 2
- Valleyview Subdivision
- West Kilworth Development Area
- Jefferies Road Outlet
- Blackburn Crescent Outlet
- Lobo
- Poplar Hill/Coldstream

# 5.0 EVALUATION OF ALTERNATIVE SOLUTIONS

As part of Phase 2 of the Municipal Class EA process, criteria for evaluating the impacts on the environment have been identified. The following criteria have been identified for evaluating the alternative solutions and selection of the preferred solution:

**Table 5-1 Evaluation Criteria**

| Environmental/Social Component | Sub-criteria | Description |
|---|---|---|
| **Socio-economic** | Impacts to future and existing land uses | Changes or impacts on future and/or existing land uses related to the construction and operation of SWM facilities (ex. Due to land acquisition requirements, changes to flows, etc.) |
| | Built cultural heritage and archaeological resources | Changes or impacts to culturally significant buildings and/or archaeological resources related to the construction and operation of SWM facilities (ex. Ground disturbance, land acquisition, etc.) |
| | Community impacts | Changes or impacts to communities related to the construction, operation and maintenance of SWM facilities (ex. Public safety concerns related to existing/future flooding, opportunities to improve public spaces, etc.) |
| **Natural Environment** | Aquatic resources | Changes or impacts to aquatic wildlife and habitat such as changes to water temperature and quality, turbidity, etc., related to the construction and operation of SWM facilities. |
| | Terrestrial resources | Impacts to significant terrestrial features such as significant woodlands, wetlands, ESAs, ANSIs and Species at Risk. |
| | Hydrogeological | Changes or impacts to groundwater resources (water quality and aquifer levels) related to the construction and operation of SWM facilities and/or associated future development. Potential impacts could include reduced infiltration volumes and potential contaminant infiltration. |
| | Drinking water source protection | Changes or impacts to drinking water and source protection policies related to the construction and operation of SWM facilities and/or associated future development. |
| **Technical** | Constructability | Location, depth of excavation, soil conditions, rock removal, groundwater control, creek crossing methods, traffic management, construction duration. |

| Environmental/Social Component | Sub-criteria | Description |
|---|---|---|
| | Operations and maintenance | Feasibility of operating and maintaining the proposed alternative given the requirements needed to keep the facility functioning appropriately. |
| | Approvals and regulatory requirements | Will the proposed alternative meet criteria set out by the Municipality of Middlesex Centre and the Government of Ontario related to stormwater management, and what environmental and other approvals will the facility require in order to operate. |
| | Performance | Will the proposed alternative effectively manage stormwater runoff and reduce flooding and other hazards. |
| **Economic** | Capital construction cost | Upfront costs associated with planning, design, approvals for and construction of the proposed alternative. |
| | Operation and maintenance costs (Long term) | Costs associated with running the SWM facility and ensuring that it remains in effective working condition. |

The evaluation of alternative solutions for each of the catchment areas are provided in Appendix D.

# 6.0 MASTER PLAN RECOMMENDATIONS

Based on the evaluation of alternative solutions found in Appendix D, as well as consultation with stakeholders, the following sections provide an overview of recommended solutions within each Catchment Area. These recommendations should also be read in conjunction with general environmental mitigation measures provided in Section 8.

## 6.1 ARVA FUTURE DEVELOPMENT AREA

Based on the initial alternative evaluation presented at PIC 2, Alternative 2 – Regional SWM facility was identified as the preliminary preferred alternative. Following discussions with the property owner and the UTRCA, the evaluation was refined and the use of Low Impact Development measures was identified as being more consistent with the proposed development.

**Alternative 3 – Local SWM Controls**

All stormwater treatment is provided to the runoff from future development in the Arva Development Area by local SWM controls. The proposed local SWM controls provide provide at-source water quality, water quantity, and erosion control treatment to the runoff from all future development and may include:

- Soakaway pits and/or bioswales to capture and infiltrate rooftop runoff;
- Underground storage to provide peak flow attenuation;
- Permeable pavement on private roadways; and
- Dry SWM ponds to provide peak flow attenuation during severe design events.

The developer's engineer will be responsible for selecting the at-source SWM control measures to treat the runoff from the future development concept. The measures must be designed to meet the post-development SWM control requirements and must be accepted by MOMC. Construction of the proposed local SWM controls will be the responsibility of the developer.

To ensure that any proposed on-site SWM controls installed, operated and maintained, Stantec recommends the following:

- The Municipality should enact a bylaw to ensure that on-site SWM controls must be operated and maintained by the property owner. The bylaw should state that the property owner is responsible for any maintenance.
- The proposed on-site SWM controls should be registered on title to prohibit their removal or alteration.
- A development agreement should include a clause stating: "The Owner shall include in all Purchase and Sale Agreements the requirement that the buildings to be designed and constructed on all Lots in this Plan are to have on-site SWM controls installed and included in the building permit application for the Lot."
- The installation of every on-site SWM control measure will need to be inspected to ensure that they are constructed in accordance with the accepted design.

This option provides flexibility to accommodate various land use concepts and eliminates the need for a crossing of Medway Road. While two separate outfalls are required to convey the treated runoff to Medway Creek, they can likely be located near the Medway Road right-of-way to mitigate natural heritage impacts. Since more than one outlet is required for this option, an additional Section 28 permit will be necessary.

Refer to Figure B4-1 in Appendix B.4 for an overview of the preferred alternative for the Arva Development area.

**Environmental and Permitting Considerations**

- The proposed outlet locations shown are approximate. A scoped Environmental Impact Study or other project review by a qualified environmental professional should be undertaken prior to detailed design to confirm the presence or absence of significant environmental features. The Study should confirm the requirements for permits or registrations under the ESA. The Study may be conducted as part of future Planning Act approvals for the site.
- A Stage 1 archaeological assessment should be undertaken to confirm the presence of absence of archaeological potential. This may be completed as part of future Planning Act approvals.
- Environmental Compliance Approvals (ECA) may be required from the MECP for proposed local SWM controls.
- Section 28 permits will be required from the UTRCA for the proposed SWM outfalls.

## 6.2 BALLYMOTE

**Alternative 2 – On-Site SWM Controls**

Stormwater treatment is provided to the runoff from all proposed development in the Ballymote Settlement Area by proposed on-site SWM controls that limit the post-development peak discharges to pre-development magnitudes. On single family residential properties, the proposed lot level controls should be located in the front yards to reduce the risk of future home improvements such as patios, decks, and pools interfering with their operation. Construction of the proposed on-site SWM controls will be the responsibility of the development proponents.

To ensure that the proposed on-site SWM controls installed, operated and maintained, Stantec recommends the following:

- The Municipality should enact a bylaw to ensure that on-site SWM controls must be operated and maintained by the property owner. The bylaw should state that the property owner is responsible for any maintenance.
- The proposed on-site SWM controls should be registered on title to prohibit their removal or alteration.
- An development agreement should include a clause stating: “The Owner shall include in all Purchase and Sale Agreements the requirement that the buildings to be designed and constructed on all Lots in this Plan are to have on-site SWM controls installed and included in the building permit application for the Lot.”

- The installation of every on-site SWM control measure will need to be inspected to ensure that they are constructed in accordance with the accepted design.

Both the Highbury Armitage Municipal Drain and the Ballymote East municipal drain will be realigned around the perimeter of the Ballymote Settlement Area. The realignment will be completed in accordance with the provisions of the *Drainage Act*. The proposed drain realignments will be the responsibility of the development proponents.

Refer to Figure B4-2 in Appendix B.4 for an overview of the preferred alternative for Ballymote.

**Environmental Considerations**

- It is anticipated that appropriate archaeological clearance will be obtained as part of the *Planning Act* approval for future development within the area.
- While no aquatic SAR were identified on the available DFO mapping, prior to relocation of the Highbury Armitage and Ballymote East municipal drains the drain classification should be confirmed, and a site-specific *Fisheries Act* review may be required.

**Potential Permit Requirements**

- ECAs from the MECP will likely not be required for the proposed on-site SWM controls since the proposed development will likely consist of single-family residential lots and each proposed on-site SWM measure will only control the runoff from a single lot. However, this should be confirmed with the MECP by the proponent prior to development.
- A Section 28 permit will be required from the UTRCA for the proposed facility and associated SWM works.
- Confirm potential authorization requirements under the *Fisheries Act* for relocation of the municipal drains.

## 6.3 ILDERTON DRAIN NO. 2

**Alternative 2 – Drain Improvements**

In accordance with the design drawings prepared by IBI, the existing 400 mm diameter concrete pipe that conveys runoff from Hyde Park Road and the upstream drainage area should be replaced with a 600 mm diameter PVC pipe to provide additional conveyance from the Hyde Park Road low point and to mitigate local flooding. While this solution does not provide drainage servicing that meets Municipal standards, it can be completed within the municipal drain working limits and does not require land expropriation. It is noted that these upgrades to the Van Bussell municipal drain were completed in September 2019, prior to the finalization of this Master Plan.

The Municipality should monitor the performance of the proposed drain improvements and over the long-term, should develop a plan to acquire the lands necessary to implement Alternative 4.

During PIC 2, Stantec was notified of several drainage problems in the Meadowcreek Subdivision. Stantec subsequently met with residents on site to discuss the following concerns:

- Some homes in the subdivision have recently experienced multiple basement floods caused by sanitary backups;
- Sump pump discharges to surface result in icy conditions on roads during the winter and persistently wet lawns that are too soft to mow in the summer;
- Sump pumps run frequently;
- Persistently wet soil conditions cause premature decay of wooden fence posts;
- The west pathway from Willowridge Road to Meadowcreek Park has been previously repaired and is currently heaving; and
- Residents were concerned that development of the Clear Skies Subdivision will exacerbate their drainage issues.

Some residents have mitigated problems caused by the sump pump surface discharges by conveying them to the curb with plastic drainage tiles or discharging directly to catchbasins. Furthermore, residents have installed backflow preventers to mitigate the risk of sanitary backups.

Based on the information provided by residents and site observations, the existing drainage concerns in the Meadowcreek Subdivision are likely caused by two factors:

- Inadequate wet weather sanitary sewer capacity; and
- High local groundwater conditions.

Stantec recommends completion of a wet weather sanitary sewer capacity analysis to identify potential inflow/infiltration problems in the Willowcreek Subdivision and provide mitigation recommendations. The study should include analysis of the Willow Ridge Road sanitary sewer and other locations where the Municipality has received basement flooding complaints.

Homes where sump pumps run frequently were likely designed without adequate consideration for the local groundwater elevations. Urban stormwater systems are typically designed to collect and convey surface runoff from rainfall events to mitigate the possibility of surface flooding. Collecting subsurface water to lower local groundwater elevations and reduce the use of residential sump pumps is not usually considered a responsibility of the municipality. However, given the widespread groundwater concerns in the Meadowcreek Subdivision, the Municipality may consider completing a hydrogeological investigation to document local groundwater elevations and provide mitigation recommendations.

Development of the Clear Skies Subdivision is unlikely to exacerbate the existing Meadowcreek Subdivision drainage problems. The Clear Skies Subdivision SWM Report shows that the surface runoff from the proposed development does not travel southward across Ilderton Road but is instead conveyed eastward to Oxbow Creek.

Refer to Figure B4-3 in Appendix B.4 for an overview of the preferred alternative for Ilderton Drain No. 2.

**Environmental and Permitting Considerations**

- Not applicable. Drain improvements have subsequently been completed.

## 6.4 SOUTH ILDERTON DEVELOMENT AREA

**Alternative 3 – Two SWM Facilities**

Two proposed regional SWM facilities are recommended to provide all necessary stormwater treatment to the runoff from the South Ilderton Development Area. Both facilities are anticipated to be designed as wet ponds. This servicing option provides flexibility for development phasing, reduces the size of conveyance infrastructure required to carry stormwater from the west side of Hyde Park Road to the proposed outlet, and manages major flows crossing Hyde Park Road.

SWM 1 is located west of Hyde Park Road and provides all necessary treatment to the runoff from proposed development. The proposed pond will also be designed to accommodate the runoff from the external undeveloped drainage area located beyond the settlement boundary. The proposed SWM pond discharges to a proposed trunk storm sewer that conveys the treated stormwater across Hyde Park Road to the Oxbow Creek Drain.

Similarly, SWM 2 provides all necessary treatment to the runoff from the east side of Hyde Park Road and discharges via the proposed outlet to the Oxbow Creek Drain. The portion of the Hughes Charlton Drain located within the Settlement Area is anticipated to be abandoned concurrent with future development.

Based on information provided by municipal staff, water levels in the Oxbow Creek Drain tend to remain high for prolonged periods following severe storm events, resulting in high tailwater conditions at the proposed pond outlets. Consequently, the proposed ponds will need to be designed to account for the effects of high tailwater elevations, which may include:

- Providing backflow prevention at the pond outlets;
- Sizing the pond outlet control structure to account for the reduced head caused by downstream tailwater conditions; and
- Providing contingency quantity control storage volume in the proposed ponds to accommodate longer detention times than anticipated.

During detailed design, consideration should be given to constructing a single outlet to the Oxbow Creek Drain to service both proposed SWM facilities. This will reduce the risk of potential impacts on the drain and corresponding permitting requirements.

Refer to Figure B4-4 in Appendix B.4 for an overview of the preferred alternative for the South Ilderton Development Area.

**Environmental Considerations**

- It is anticipated that appropriate archaeological clearance will be obtained as part of the *Planning Act* approval for future development within the area.
- No aquatic SAR were identified on the available DFO mapping for the Oxbow Creek drain in this location; however, a review should be conducted prior to construction of the proposed outlet to identify potential impacts on habitats within the drain and potential authorization under the *Fisheries Act*.

**Permitting Considerations**

- An ECA will be required from the MECP for the proposed regional SWM facilities.
- A Section 28 permit will be required from the UTRCA for the proposed facilities and associated outlet works.

## 6.5 KOMOKA DRAIN NO. 1

**Alternative 6 – Combine Alternatives 3 and 5**

Stormwater treatment for the Komoka Drain No. 1 catchment area is provided by a proposed stormwater management pond located on the west side of Komoka Road. The proposed SWM pond is a former gravel pit that will be repurposed as a wet pond designed in accordance with MECP criteria to provide both water quality and peak flow control to the runoff from the upstream service area including:

- The Komoka Drain No. 1 drainage area,
- The proposed Glendon Drive streetscape improvements, and
- The existing commercial and residential development located southwest of the Komoka Road/Glendon Drive intersection.

Runoff from the Tunks Lane future development is treated by on-site SWM controls that discharge to the proposed Glendon Drive storm sewer.

The proposed pond discharges to an approximately 700 m long proposed outlet storm sewer on Glendon Drive that conveys the treated flows southward to the Komoka Provincial Park pond. Recently completed outlet improvements at the Park pond have reduced the Provincial Park pond normal water elevation. While the outlet structure was designed to reduce the normal water level to 228.0 m, Ontario Parks is in the process of reevaluating this target. An existing neighboring privately owned pond discharges directly to the park pond through a 400 mm diameter CSP culvert with and invert elevation of approximately 229.31 m.

Both Ontario Parks staff and the neighboring pond owner were consulted to identify concerns associated with utilizing the existing park pond outlet to convey the treated stormwater to the Thames River. Initial concerns identified by park staff included effects on pond levels, water quality concerns, and resulting impacts on flora and fauna. Similarly, the neighboring pond owner expressed concerns regarding potential impacts on their pond water levels. Stantec completed a preliminary hydrologic/hydraulic assessment to evaluate the anticipated impacts. The assessment was completed based on the original park design normal water level of 228.0 m, and the results suggest:

- No significant water quality impacts are anticipated, as the stormwater is treated in accordance with MECP standards and can be discharged to the natural environment, in accordance with the Ontario *Water Resources Act*;
- No significant impact on pond water levels or drawdown times, since during the 250-year storm event, the additional flows to the existing outlet only increase the maximum calculated water surface elevations in the park pond by approximately 0.12 m; and

- No significant impact on the neighboring privately owned pond since the maximum 250-year calculated water surface elevation is 228.82 m, which is lower than the invert of the existing connecting culvert.

The UTRCA identified several concerns with the SWM 1 location including the possibility of loss of storage volume caused by high groundwater levels, lack of sufficient storage volume, and groundwater contamination caused by interaction with surface water. Each of these concerns is addressed as follows:

- SWM 1 will have a permanent surface water outlet to the proposed trunk storm sewer which will provide certainty regarding the long term water levels;
- Stantec completed hydrologic/hydraulic calculations to confirm that the proposed pond footprint is sufficient to accommodate the anticipated post-development runoff volumes; and
- Groundwater contamination concerns can be mitigated by instituting a salt management plan in the upstream drainage area and by providing a clay liner within the proposed pond forebay.

Refer to Figure B4-5 in Appendix B.4 for an overview of the preferred alternative for Komoka Drain No. 1.

**Environmental and Permitting Considerations**

- Approval under the Provincial Parks and Conservation Reserves (PPCR) Class EA is required. This generally includes the completion of the Record of Screening form, and may require additional ecological field investigations. It is noted that the Komoka Provincial Park Pond is mapped as a Provincially Significant Wetland as part of the Komoka Park Wetland Complex UT1, and that SAR may be present. This process should be commenced immediately upon commencing the project, and will confirm any additional permitting or registration requirements under the ESA and Parks Class EA. See the correspondence and information related to the Ontario Parks pond and regulatory requirements, including the PPCR Class EA in Appendix A.6.
- Infrastructure Ontario holds title over the Komoka Provincial Park Lands. The registration of an easement in favour of the Municipality from Infrastructure Ontario will be required for both the proposed inlet and use of the existing outlet structure. In order to register the easement, Infrastructure Ontario requires due diligence on the property, which may include a market assessment of the subject lands, EAs (which may be coordinated through the PPCP Class EA), archaeological assessments, and Duty to consult with First Nations. This process should be coordinated with Infrastructure Ontario and the MECP as early in the processes as possible in order to confirm project requirements and review times.
- The Municipality shall work with Ontario Parks to develop an outflow agreement to formalize roles and responsibilities associated with the existing outlet (e.g. regular maintenance).
- It is anticipated that the Municipality will obtain ownership of the existing pond (proposed SWM 1).
- An ECA will be required from the MECP for the proposed SWM facility.

Should the required permits and approvals, including the PPCR Class EA, not be secured for the proposed Park pond outlet, an alternate outlet may be constructed along Komoka Road as shown in Alternative 3. While this alternative is less-preferred due to the costs associated with constructing the sewer along Komoka Road, as well as the added environmental impacts associated with the new outlet to the Thames River, it should be considered as a contingency in the event the appropriate approvals

cannot be secured. It is noted that a scoped Environmental Impact Study should be undertaken to assess impacts to sensitive habitats along the Thames River associated with the new outlet, along with required permits through the UTRCA.

## 6.6 KOMOKA DRAIN NO. 3

**Alternative 2 – Service Only Proposed Development**

A proposed stormwater management facility located on the north side of Oxbow Drive and east of the CN railway line will provide all necessary stormwater treatment to the runoff from the proposed development located west of Komoka Road. Runoff from more frequent storm events will be attenuated in the facility and discharged to Komoka Drain No. 3, based on the available municipal drain capacity. Runoff from severe storm events may be discharged to the existing overland flow route that conveys surface flows to the downstream CP Rail culvert.

Since Komoka Creek supports a coldwater fishery, the proposed facility will mitigate potential temperature impacts. This may be achieved by discharging the water quality control volume via infiltration. If the proposed SWM facility includes an infiltration component, pretreatment will be required to remove suspended sediment from the incoming stormwater. A hydrogeological assessment will be required prior to detailed to identify the maximum local groundwater elevations. If stormwater infiltration is proposed, the hydrogeological assessment will measure existing infiltration rates and establish the pond design infiltration volume.

Overflows from the upstream external drainage areas are conveyed around the perimeter of the proposed development by a proposed bypass swale. While the bypassed flows may be discharged to the existing overland flow route that conveys surface flows to the downstream CP Rail culvert. However, the proposed SWM design will need to provide sufficient documentation to demonstrate that the post-development discharges to not raise the risk of downstream flooding and/or erosion.

During PIC 2, Union Avenue residents expressed concerns regarding the frequency and magnitudes of flows in the Komoka Drain Union Avenue Branch. The residents had not experienced flooding onto their properties from the drain or flood damage. Stantec subsequently completed a site visit to identify potential drainage deficiencies. The results of the site inspection identified several operation and maintenance items and potential future improvements to the Union Avenue culvert. However, no significant drainage deficiencies were identified. Based on the site visit results, a review of the available Komoka Drain Union Avenue Branch design information, and pictures and descriptions provided by the residents, the drain appears to be operating in accordance with its design. Since the site visit, a drainage petition was initiated in accordance with the Drainage Act to review the drain performance.

Refer to Figure B4-6 in Appendix B.4 for an overview of the preferred alternative for Komoka Drain No. 3.

**Environmental and Permitting Considerations**

- It is anticipated that appropriate archaeological clearance will be obtained as part of the Planning Act approval for future development within the area.

- An ECA will be required from the MECP for the proposed SWM facility.
- A Section 28 permit may be required from the UTRCA for the proposed facilities and associated SWM works.

## 6.7 WEST KOMOKA DEVELOPMENT AREA

**Alternative 2 – Service Only Proposed Development**

The future land use identified in the Official Plan in this catchment area is Settlement Employment. Runoff from this future development is treated by two proposed SWM facilities.

SWM 1, located west of Komoka Creek, provides both water quality treatment and peak flow control to the proposed development runoff. The available soils information and the lack of a defined channel downstream of the culvert suggest that the site soils are extremely permeable. Consequently, SWM 1 will be designed primarily as an infiltration facility, with overflows directed to a proposed piped outlet that conveys them eastward to Komoka Creek. Additionally, future developments within the proposed SWM 1 service area should be designed with on-site infiltration measures to retain the runoff from small frequent storm events and infiltrate the captured runoff over a larger area.

SWM 2, located west of Komoka Creek, provides both water quality treatment and peak flow control to the proposed development runoff. The proposed pond will be designed as a dry facility. Since Komoka Creek supports a coldwater fishery, the proposed facility will mitigate potential temperature impacts by discharging the water quality control volume via infiltration. Runoff from more significant storm events will be attenuated in the facility and discharged to Komoka Creek via a proposed pipe outlet

Since the proposed SWM facilities include infiltration component, pretreatment will be required to remove suspended sediment from the incoming stormwater. A hydrogeological assessment will be completed prior to detailed design to measure soil permeability, identify the maximum local groundwater elevations, and establish the pond design infiltration volume. Industrial land uses should be avoided in this area, as current MECP guidance states that runoff from industrial sites should not be treated using infiltration measures due to the associated risk of groundwater contamination.

Refer to Figure B4-7 in Appendix B.4 for an overview of the preferred alternative for the West Komoka Development area.

**Environmental and Permitting Considerations**

- The proposed SWM facility locations shown are approximate. A scoped Environmental Impact Study or other project review by a qualified environmental professional should be undertaken during the planning and design of future development within the area to confirm the presence or absence of significant environmental features. The Study should confirm the requirements for permits or registrations under the ESA.
- A Stage 1 archaeological assessment should be undertaken to confirm the presence of absence of archaeological potential. This may be completed as part of future Planning Act approvals.

- An Environmental Compliance Approval (ECA) will be required from the MECP for the proposed SWM facilities
- A Section 28 permit will be required from the UTRCA for the proposed facility and associated SWM works.

## 6.8 NORTHEAST KOMOKA DEVELOPMENT AREA

**Alternative 3 – Two SWM Facilities**

Runoff from future development in the Northeast Komoka Development Area will be treated by two proposed SWM facilities. Stormwater from the eastern portion of the catchment is treated by SWM 1, which provides water quality treatment and peak flow control prior to discharging to Oxbow Creek. The proposed pond will be designed as a dry facility to mitigate potential temperature impacts on Oxbow Creek. Pretreatment will be provided upstream of the facility to verify that the proposed SWM measures provide Enhanced Protection Level water quality treatment.

The western portion of this catchment is a former gravel pit that currently drains exclusively via infiltration and evaporation. Runoff from future development in this area will be treated by SWM 2, which will detain all runoff from the future residential development and release it via infiltration, similar to existing conditions. Pretreatment will be required to remove suspended sediment from the post-development runoff prior to discharging to SWM 2.

Concerns were identified by UTRCA with respect to interaction and contamination of groundwater through site infiltration, the possibility of increased long term groundwater levels, and the longer term capacity of SMW 2. These concerns will be mitigated as follows:

- Stormwater pretreatment and development and implementation of a salt management plan will reduce the possibility of groundwater contamination;
- A hydrogeological assessment will be completed prior to detailed design to identify the maximum anticipated post-development pond water level and to estimate future minimum infiltration rates;
- The proposed pond will be designed with contingency storage volume above the 250-year storage volume to reduce the risk of storage loss due to higher than anticipated long-term groundwater levels and/or lower than anticipated design infiltration rates;
- The proposed pond incorporates an emergency overflow that discharges to the neighboring park block to limit the maximum pond elevations;
- The local finished floor elevations will be at least 0.3 m higher than the spill elevation of the downstream emergency overland flow route; and
- If post-construction monitoring suggests that the pond does not provide sufficient capacity to accommodate the site runoff, a contingency overflow pipe will be constructed to convey stormwater eastward to Oxbow Creek.

While there is an active development application for the proposed SWM 2 development area, there are no known current plans to develop the lands that include the contingency overflow pipe. However, SWM 2

could proceed provided the proposed pond design incorporates a surface emergency flow route at the top of the contingency storage elevation that dicharges westward to the neighboring park block.

Refer to Figure B4-8 in Appendix B.4 for an overview of the preferred alternative for the Northeast Komoka Development area.

**Environmental and Permitting Considerations**

- A Stage 1 archaeological assessment should be undertaken to confirm the presence or absence of archaeological potential. This may be completed as part of future Planning Act approvals.
- An Environmental Compliance Approval (ECA) will be required from the MECP for the proposed SWM facilities.
- A Salt Management Plan should be prepared as part of the planning and design of the future development and SWM facilities at the site. The usage of salt should be minimized to prevent potential groundwater and surface water contamination.
- A Section 28 permit will be required for the proposed outfall to Oxbow Creek.

## 6.9 KILWORTH GLENDON DRIVE AREA

**Alternative 3 – Discharge to Glendon Drive Trunk Storm Sewer**

The proposed Glendon Drive streetscape improvements include a proposed trunk storm sewer to collect and convey minor flows from the proposed right-of-way westward to a future outlet, as described in the Komoka Drain No. 1 recommendations. This proposed trunk storm sewer will provide the outlet from future development located north of Glendon Drive. Major flows from the portion of the proposed Glendon Drive streetscape improvements located in this catchment are conveyed to Oxbow Creek by the existing overland drainage route.

A proposed regional SWM pond will provide all necessary stormwater treatment to the runoff from future development located north of Glendon Drive. Minor flows will be conveyed to SWM 1 by proposed local storm sewers and major flows are conveyed by the future right-of-ways. Given the local sandy soils, LID measures to capture and retain runoff near its source are likely a feasible strategy for reducing the peak minor system flows and the SWM1 design storage volumes.

The treated flows from SWM1 are discharged to a proposed storm sewer on Tunks Lane, that discharges to the future Glendon Drive trunk storm sewer. Given the recent development activity in the Tunks Lake Area, the Municipality should develop a plan to secure a drainage corridor from this catchment area to Tunks Lane to prevent obstruction of this drainage route by future development.

Major flows within the Tunks Lane area will continue to follow the existing surface drainage route and future development proposals must accommodate external major flows.

It should be noted that the proposed SWM facility location is approximate and should be confirmed through the planning and design of future development areas.

Refer to Figure B4-9 in Appendix B.4 for an overview of the preferred alternative for the Kilworth Glendon Drive area.

**Environmental and Permitting Considerations**

- A Stage 1 archaeological assessment should be undertaken to confirm the presence of absence of archaeological potential. This may be completed as part of future Planning Act approvals.
- An Environmental Compliance Approval (ECA) will be required from the MECP for the proposed SWM facilities

## 6.10 KILWORTH EAST (KILWORTH PARK DRIVE)

**Alternative 2 – SWM Strategy per Glendon Drive EA**

In accordance with the recommendations of the Glendon Drive Streetscape EA, all runoff from this portion of the Glendon Drive improvements will be collected and treated by a proposed enhanced grass swale located on the north side of the Glendon Drive right-of-way. The proposed enhanced grassed swale will be designed in accordance with MECP guidelines to provide water quality treatment and will incorporate check dams to provide peak flow control. The proposed enhanced grassed swale will discharge to the Thames River.

Given the significant anticipated street and property impacts, replacement of the existing concrete lined ditches in the Kilworth Subdivision is not recommended at this time, though they should be maintained and repaired as needed. The Municipality could consider replacing driveway culverts that are prone to debris accumulation with improved inlets to reduce maintenance requirements.

Refer to Figure B4-10 in Appendix B.4 for an overview of the preferred alternative for the Kilworth East area.

**Environmental and Permitting Considerations**

- A Stage 1 archaeological assessment was conducted as part of the Glendon Drive Class EA, which identified recommendations for further assessment where archaeological potential exists. Further assessments should be conducted prior to detailed design.
- The Komoka Provincial Park ANSI is located on the north side of Glendon Drive, which has the potential to contain a number of SAR habitats. During detailed design of the roadway and drainage improvements, site assessments should be conducted to delineate the extent of the significant environmental features, assess impacts of the design and construction, provide appropriate mitigation, and identify potential permitting or registration under the ESA. Impacts are anticipated to be restricted to edge impacts and can be managed by best practices including those identified in Section 8.

## 6.11 MELROSE

**Alternative 2 – Relocate Drainage System**

It is recommended that the existing municipal drains located in the residential rear yards be abandoned and replaced with rear yard catchbasins with leads that connect to the local storm sewers located in the municipal right-of-ways. The proposed leads will be located in proposed drainage easements offset from existing property lines to mitigate the risk of damage caused by future home improvements. Easements may be registered on title. Where feasible, trenchless installation should be considered to reduce construction disruption on affected homeowners.

Refer to Figure B4-11 in Appendix B.4 for an overview of the preferred alternative for the Melrose area.

**Environmental and Permitting Considerations**

- Construction of the proposed storm sewers are located within existing developed areas and are not anticipated to impacts natural or archaeological resources.
- Easements may be required to be registered on title.

## 6.12 REMAINING SETTLEMENT AREAS

Alternative solutions were not evaluated for the remainder of the Settlement Areas/Catchment Areas based on the screening conducted in Section 3.5. However, recommendations for maintenance and operational improvements have been identified below.

**Arva – Built Up Area**

At PIC 2, residents of the St. John's Drive condominium noted surface ponding and basement flooding on their property that they attributed to runoff from the neighboring Wheldon Park. Stantec completed a site visit during the Summer of 2019 to review the existing site conditions. Based on the results of our field observations, construction of a shallow grassed swale is recommended to intercept the park runoff and convey it to the existing park ponds.

The mill pond outlet structure should assessed to develop recommendations to reduce debris accumulation and the possibility of clogging.

A geotechnical review of the downstream slope of the mill pond embankment should be completed to evaluate the severity of the gabion mat subsidence and provide mitigation measures, if necessary.

**Birr**

The Municipality should complete periodic inspection of all catchbasins located at low points, particularly during autumn, to verify that grates are free of debris.

Runoff from the future development area located north of Thirteen Mile Road will be controlled by on-site SWM controls in accordance with the following criteria:

- Provide Enhanced Protection Level water quality control to remove 80% of Total Suspended Solids (TSS) from stormwater; and

- Attenuate the peak discharges from all design events up to and including the 100-year storm to pre-development magnitudes.

The existing Salisbury Drive storm sewer should be considered as a minor system outlet for the proposed development, provided peak discharges can be attenuated to the available storm sewer capacity.

**Bryanston**

The grades of of future development on the west side of Highbury Avenue will need to be sufficiently high to mitigate the risk of flooding caused by local ponding. However, care will be required to verify that the proposed grading does not negatively affect drainage on neighboring properties.

The Municipality should work with Middlesex County to develop a plan to address the existing roadside ponding caused by the county-owned culverts.

**Denfield**

Channel maintenance should be performed on the outlet channel from the Brookfield Street storm sewer to reduce the possibility of flooding and the Brookfield Street ditch inlet catchbasion.

**Ilderton Drain No. 1**

The Municipality should continue to monitor reports of ponding concerns in the Timberwalk Subdivision tree protection areas to determine whether ponding mitigation measures are necessary.

**Ilderton Drain No. 3**

Ilderton Road west of Hyde Park Road should be urbanized to reduce the possibility of major flows entering private properties on the south side of Ilderton Road.

**Komoka Drain No. 2**

There are no specific drainage recommendations for Komoka Drain No. 2.

**Valleyview Subdivision**

There are no specific drainage recommendations for Valleyview Subdivision.

**West Kilworth Development Area**

There are no specific drainage recommendations for the West Kilworth Development Area.

**Jefferies Road Outlet**

There are no specific drainage recommendations for the Jefferies Road Outlet.

**Blackburn Crescent Outlet**

At PIC 2, a resident of Baron Crescent reported surface ponding and basement flooding had occurred on his property during the July 2018 storm event. Stantec met with the homeowner on-site to review the existing drainage conditions. The available information suggests that the sump pump did not have sufficient capacity to convey the water collected by the weeping tiles during the storm event but that local surface ponding did not encroach into the existing building envelope. The homeowner has since installed mitigation measures to reduce the possibility of future basement flooding. Based on the available subdivision design drawings, the maximum roadway ponding depth is greater than the municipal standard of 0.3 m. While it's unlikely that the roadway ponding contributed to the basement flooding, any future road replacement works should consider the possibility of modifying the road profile to reduce the maximum ponding depth.

The Municipality should work with the homeowner at the Pioneer Drive low point to develop a major flow outlet to the Thames River.

**Lobo**

The Municipality should coordinate ditch maintenance with Middlesex County to reduce the possibility of local ponding.

**Poplar Hill/Coldstream**

The Municipality should secure a drainage easement on the property that conveys major flows from Currie Court to protect the flow path and prevent construction of structures that could be damaged by surface flows.

Runoff from the future development areas should be controlled by on-site SWM controls in accordance with the following criteria:

- Provide Enhanced Protection Level water quality control to remove 80% of Total Suspended Solids (TSS) from stormwater; and
- Attenuate the peak discharges from all design events up to and including the 100-year storm to pre-development magnitudes.

Local surface ponding at Valleyview Elementary School should be addressed by installing a culvert under Ilderton Road that discharges to the Coldstream reservoir.

**All Settlement Areas**

Concurrent with future roadworks, all municipal storm sewers should be replaced with systems designed in accordance with current municipal standards

# 7.0 CONSULTATION SUMMARY

## 7.1 PUBLIC CONSULTATION

Consultation with potentially affected persons is a vital part of the EA process, both in the collection of background information used to identify key issues, and in the development of the preferred solutions to best address all stakeholders' concerns while satisfying the Problem/Opportunity statement for the particular project. At the outset of the project, a stakeholder list was developed which included government agencies, conservation authorities, and Indigenous Communities, to which all project notification was sent. The contact list has been included in Appendix A.1.

In addition to the standard points of contact including the Notice of Commencement (Appendix A.2), and the Notice of Public Consultation Centre (Appendix A.3), an online webmap was created and hosted on the Municipality's website (www.middlesexcentre.on.ca/stormwater) to obtain specific information on residents' existing stormwater drainage issues and concerns. The results were reviewed and addressed where feasible in the development of alternative solutions. A copy of input received from the online webmap is provided in Appendix A.5.

A number of site visits were also conducted throughout the study in order to investigate the nature of specific flooding concerns. Summaries of field visits are included in Appendix A.5.

### 7.1.1 Public Information Centres

#### 7.1.1.1 Public Information Centre – Round 1

The first round of Public Information Centres (PIC) was held on May 7, May 8 and May 10, 2018 from 6:30 pm to 8:30 pm. The PICs were structured as a drop in centre where members of the project team were available to answer questions. The purpose of the PICs was to present information in the study and existing drainage conditions throughout the Municipality. Information presented at the PICs include:

- Purpose of the PIC;
- What is a Stormwater Management Plan;
- What is Stormwater Management and Why is it Important?
- Phase 1: Problems and Opportunities;
- Definitions of Elements of Stormwater Infrastructure;
- Phase 2: Existing Drainage Conditions and Key Issues; and
- Next Steps.

Following the PICs, display boards and comment sheet were posted on the Municipality's website (www.middlesexcentre.on.ca/stormwater). A copy of the PIC boards and comment sheets received can be found in Appendix A.3.

The May 7 PIC was held at the Komoka Wellness and Recreation Centre, located at 1 Tunks Lane, Komoka. Five (5) people attended the PIC, not including members of the project team.

The May 8 PIC was held at the Ilderton Community Centre, located at 13168 Ilderton Road, Ilderton. Four (4) people attended the PIC not including members of the project team.

The May 10 PIC was held at the Byranston Community Centre, 15321 Plover Mills Road, RR3, Ilderton. Five (5) people attended the PIC, not including members of the project team.

#### 7.1.1.2 Public Information Centre – Round 2

The second round of PICs was held on March 4, March 5 and March 6, 2019 from 6:00 pm to 8:00 pm. Similar to the first round of PICs, they were structured as a drop in centre where members of the project team were available to answer questions. The purpose of the PICs was to present the draft Master Plan recommendations for review and comment. Information presented at the PICs include:

- The Purpose of the PIC;
- What is a Stormwater Master Plan;
- What is Stormwater Management and Why is it Important;
- What We've Heard so Far;
- Phase 2 Existing Drainage Conditions and Key Issues;
- Evaluation Criteria;
- Evaluation Summaries; and
- Next Steps.

Following the PICs, display boards and comment sheet were posted on the Municipality's website (www.middlesexcentre.on.ca/stormwater). A copy of the PIC boards and comment received can be found in Appendix A.3.

The March 4 PIC was held at the Komoka Wellness and Recreation Centre, 1 Tunks Lane, Komoka. 14 people attended the PIC, not including members of the project team.

The March 5 PIC was held at the Ilderton Community Centre, 13168 Ilderton Road, Ilderton. 15 people attended the PIC, not including members of the project team.

The March 6 PIC was held at the Bryanston Community Centre, 15321 Plover Mills Road, RR3, Ilderton. 12 people attended the PIC, not including members of the project team.

# 7.2 REVIEW AGENCY AND INDIGENOUS CONSULTATION

## 7.2.1 Review Agency Consultation

### 7.2.1.1 Ministry of the Environment, Conservation and Parks

The Ministry of the Environment, Conservation and Parks (MECP) were circulated on all project notices. The MECP responded to the Notice of Commencement in a letter dated February 28, 2018 noting the receipt of the notice. The letter also outlined First Nations consultation requirements, First Nations communities who have been identified as potentially being affected by the project, requirements for source water protection and climate change. MECP also requested a draft copy of the Master Plan for technical review prior to filing of the final report as well as a final copy of the final Master Plan.

### 7.2.1.2 Ministry of Natural Resources and Forestry

The Ministry of Natural Resources and Forestry (MNRF) were circulated on all project notices. The MNRF responded to the updated Notice of Commencement in a letter dated March 6, 2018 noting that a screening of natural heritage (including species at risk) or other resource values for this project has not been completed. The letter provided guidance on identifying and assessing natural features and resources as required by applicable policies and legislation and engaging with MNRF Aylmer District for advice as needed. Refer to Appendix A.4 for records of correspondence with the MNRF.

### 7.2.1.3 Ministry of Heritage, Sport, Tourism, and Culture Industries

The Ministry of Heritage, Sport, Tourism, and Culture Industries were circulated on all project notices. The MHSTCI responded to the Notice of Commencement in a letter dated March 26, 2018. The letter noted the Ministry's interests related to this project which included archaeological resources (land based and marine); built heritage resources (bridges and monuments); and cultural heritage landscapes. MHSTCI also requested that if the screening has identified no known or potential cultural heritage resources, or no impacts to these resources, the completed checklists and supporting documentation be included in the Master Plan Report.

Recommendations for further assessment with respect to cultural heritage resources for specific projects have been identified within Section 6, and additional considerations are included in Section 8.7 Environmental Mitigation Recommendations. Refer to Appendix A.4 for records of correspondence with the MHSTCI.

### 7.2.1.4 The Upper Thames River Conservation Authority

The Upper Thames River Conservation Authority (UTRCA) were circulated on all project notices. The UTRCA provided comments on the Preliminary Recommendations in an email dated February 5th, 2020. The email noted the UTRCA's concern regarding the feasibility of SWM infiltration, given the elevated

water table levels in Middlesex Centre. The UTRCA recommends that preliminary hydrogeological monitoring should be undertaken prior to construction of SWM facilities to determine groundwater levels. The UTRCA notes that if preliminary hydrogeological monitoring is not feasible, the Master Plan should include consideration for groundwater for all SWM infrastructure and the consideration of local soils and potential for erosion at each site when choosing appropriate SWM facility locations.

A list of comments and concerns were provided by the UTRCA on Wednesday February 5, 2020, and a meeting was held with the project team on February 11, 2020 to discuss. A record of comments/concerns and how they have been addressed within the project recommendations has been provided in A.4.

### 7.2.2 Indigenous Consultation

Indigenous Communities throughout Southern Ontario were contacted over the duration of the study based on correspondence with the MECP, location of traditional territory, and known interests. Project notices were mailed to communities and follow up calls were made to discuss the project components and determine the best method of consultation. All points of contact are documented in the TRACER table found in Appendix A.7.

A response was received from the Chippewas of the Thames First Nation in February 2019 noting moderate interest in the project. Follow up discussions were held, and draft project documentation was provided to the Chippewas of the Thames First Nation prior to the issuance of the 30-day review period. Additional correspondence and input will be incorporated into a Post-Filing Report to ensure any concerns are reflected in the Master Plan recommendations and carried through subsequent project phases.

# 8.0 COSTS AND PROJECT IMPLEMENTATION

## 8.1 CLASS EA PROJECTS AND SCHEDULES

Excluding regular maintenance activities, recommended projects and their associated Municipal Class EA Schedules have been identified below. Provided the recommendations for further site-specific studies are completed as per the recommendations within Section 6, this Master Plan generally addresses consultation and assessment requirements for Schedule B projects. Additional permitting and approvals may also be required, as noted below and in Section 6.

**Table 8-1 Class EA Schedule of Preferred Alternatives**

| Settlement Area | Preferred Alternative & Project Description | Class EA Schedule |
|---|---|---|
| **Arva** | Alternative 3 – Local SWM Controls<br>Onsite SWM controls will be the responsibility of the development proponent.<br>The proposed project will require Section 28 permits from the UTRCA. | Not Applicable |
| **Ballymote** | Alternative 2 – On-Site SWM Controls<br>Onsite SWM controls will be the responsibility of the development proponent. | Not Applicable |
| **Ilderton Drain No. #2** | Alternative 2 – Drain Improvements<br>Replacement of the existing 400 mm pipe with a 600 mm diameter PVC pipe to increase conveyance while the Municipality acquires the land to implement Alternative 4. | Not Applicable |
| **South Ilderton Development Area** | Alternative 3 – Two SWM Facilities<br>Two SWM facilities will be constructed on the east and west sides of Hyde Park Road. The proposed storm ponds will discharge to the Oxbow Drain. The existing Hughes Charlton Drain will be replaced with proposed storm sewers. | Schedule A |
| **Komoka Drain No. #1** | Alternative 6 – Combine Alternatives 3 and 5<br>A wet SWM pond will be constructed in the former gravel pit to the west of Komoka Road. The pond will discharge a via proposed storm sewer along Glendon Drive and will discharge to the existing Komoka Provincial Park pond.<br>Runoff from future development along Tunks Lane will be conveyed via the proposed Glendon Drive trunk storm sewer. | Schedule B<br>Provincial Parks and Conservation Reserve EA and Infrastructure Ontario approval (easement) |
| **Komoka Drain No. #3** | Alternative 2 – Service Only Proposed Development<br>A SWM facility and bypass channel will be constructed. The pond be designed to mitigate potential impacts of stormwater on Komoka Creek. | Schedule A |

| Settlement Area | Preferred Alternative & Project Description | Class EA Schedule |
|---|---|---|
| **West Komoka Development Area** | Alternative 2 – Service Only Proposed Development<br>Both SWM facilities will be designed primarily for infiltration but will include pipe outlets to Komoka Creek for significant storm events. Because both SWM facilities involve infiltration, pretreatment will be required to reduce sediment loads. | Schedule A |
| **Northeast Komoka Development Area** | Alternative 3 – Two SWM Facilities<br>SWM1 will be designed as a dry pond and will require treatment upstream of the facility in order to mitigate potential impacts on Oxbow Creek.<br>SWM 2 will be constructed as an infiltration facility. Pretreatment will be required in order to remove suspended solids from runoff. | Schedule A |
| **Kilworth Glendon Drive Area** | Alternative 3 – Discharge to Glendon Drive Trunk Storm Sewer<br>The proposed improvements along Glendon Drive include a trunk storm sewer which will convey minor flows to a proposed outlet.<br>A regional wet SWM pond will also be constructed, along with local storm sewers which will convey runoff from the proposed development north of Glendon Drive. Treated runoff from the SWM pond will then be discharged via a proposed sewer along Tunks Lane which will connect the proposed Glendon Drive trunk storm sewer. | Schedule B |
| **Kilworth East (Kilworth Park Drive)** | Alternative 3 – SWM Strategy per Glendon Drive EA<br>All runoff from this portion of Glendon Drive will be collected and treated via enhanced grass swale on the north side of the Glendon Drive right-of-way before being discharged to the Thames River. | Schedule A |
| **Melrose** | Alternative 2 – Relocate Drainage System<br>The existing municipal drains will be abandoned and replaced with rear-yard catch basins that connect to storm sewers in the municipal rights-of-way.<br>A drainage easement will be obtained to reduce risk of damage to the leads caused by future home improvement activities. | Schedule B |

## 8.2 COST ESTIMATES

A preliminary opinion of probable costs was developed for each of the identified projects based on recent pricing for similar construction projects.

### 8.2.1 Level of Cost Estimates

ASTM E 2516-06 (Standard Classification for Cost Estimate Classification System) provides a five-level classification system based on several characteristics, with the primary characteristic being the level of project definition (i.e., percentage of design completion). Section 7.5.4 of ASTM E 2516 acknowledges that other “secondary” characteristics impact the accuracy of the estimate, and provides as follows:

"In summary, estimate accuracy will generally be correlated with estimate classification (and therefore the level of project definition), all else being equal. However, specific accuracy ranges will typically vary by industry. Also, the accuracy of any given estimate is not fixed or determined by its classification category. Significant variations in accuracy from estimate to estimate are possible if any of the determinants of accuracy, such as differing technological maturity, quality of reference cost data, quality of the estimating process, and skill and knowledge of the estimator vary. Accuracy is also not necessarily determined by the methodology used or the effort expended. Estimate accuracy must be evaluated on an estimate-by-estimate basis, usually in conjunction with some form of risk analysis process."

Opinions of probable cost for each of the preferred alternatives are included in Appendix E, and should be considered as Class 4 estimates (as extent of work is considered within 1% to 15% of "complete"). A Class 4 estimate is defined by the following:

- Class 4 (other definitions: Class IV, Level 2, Class C): This is generally referred to as a preliminary, feasibility, schematic design, predesign, authorization or basic system cost opinion. It is used for detailed planning, evaluation of alternatives, confirm economic viability, preliminary budget approval and cash flow projections. At this stage the project concept and scope have been established and enough work completed to define capacities and processes resulting in block schematics, plot plans, process flow diagrams, general arrangement drawings and infrastructure requirements. The cost opinion is based on elemental units using historical costs, standard estimating references, supplier quotes and historical data from similar projects.

Based upon the above discussion, Stantec does not guarantee the accuracy of this opinion of probable cost. The actual final cost of any identified project will be determined through the bidding and construction process, and subject to further refinement of design and determination of overall scope of work. Furthermore, these costs are intended to represent the cost to complete the stormwater upgrades, including all required restoration works. Where work is deemed not to be critical (i.e. stormwater works that are not required immediately to address public health/safety risk or to allow development to proceed), the Municipality may wish to align upgrades with other capital initiatives such as the road upgrades program. Coordination of municipal projects will reduce overall costs and minimize overall impacts to residents.

Cost estimates below include anticipated construction costs, contingency, and engineering costs at a percentage of construction, which provides an allowance for typical permits and site investigations (geotechnical and hydrogeological).

### Table 8-2 Projects, Class EA Schedule, and Estimated Costs

| Project/Drainage Area | Preferred Alternative | Estimated Cost |
|---|---|---|
| Arva Development Area | Alternative 3 | $300,000 |
| Ballymote | Alternative 2 | $100,000 |
| Ilderton Drain No. 2 | Alternative 2 | $150,000 |

| Project/Drainage Area | Preferred Alternative | Estimated Cost |
|---|---|---|
| South Ilderton Development Area | Alternative 3 | $5,350,000 |
| Komoka Drain No. 1 | Alternative 6 | $4,300,000 |
| Komoka Drain No. 3 | Alternative 2 | $1,300,000 |
| West Komoka Development Area | Alternative 2 | $4,800,000 |
| Northeast Komoka Development Area | Alternative 3 | $2,250,000 |
| Kilworth Glendon Drive Area | Alternative 3 | $2,500,000 |
| Kilworth East | Alternative 2 | $410,000 |
| Melrose | Alternative 2 | $350,000 |

## 8.3 PROJECT TRIGGERS AND PHASING

### 8.3.1 Project Triggers

The implementation of improvements identified within the Master Plan should generally be triggered by the following:

- Infrastructure failure or works required immediately to address public health/safety risks;
- Projects required during development applications to allow development to proceed;
- Improvements that can be coordinated with required road maintenance or other capital projects;
- The availability of municipal funding; and/or
- The ability to secure Provincial and/or Federal level funding (i.e., future infrastructure funding programs, Gas Tax programs, etc.).

## 8.4 PERMIT REQUIREMENTS

Anticipated permit requirements have been identified for Master Plan projects identified in Section 6. In general, for any oil-grit separators proposed within the Master Plan, Environmental Compliance Approvals (ECAs) will be required from the Ministry of Environment, Conservation and Parks (MECP), and maintenance of the units must be performed in accordance with the terms and conditions within the ECAs. Similarly, ECAs will be required prior to the construction of any new storm sewers and related appurtenances or where replacement works require modification to sizing/capacity or modification to the drainage areas, particularly for systems currently defined under the *Drainage Act,* which are presently excluded from MECP approval requirements.

Section 28 permits will be required from the appropriate Conservation Authority for any modifications to existing outlets, or for the installation of new outlets within Conservation Authority regulated lands.

Permitting and/or Registration will be required for any activities that have the potential for disruption to habitat for Endangered or Threatened Species under the *Endangered Species Act*, through the MNRF.

## 8.5 MUNCIPAL DRAINS

We recommend that all municipal drains located within the settlement areas, which are subject to the new stormwater levy introduced by the Municiplity, ultimately be abandoned once they are brought up to municipal standards. While improvements to municipal drains must be undertaken in accordance with the provisions of the *Drainage Act*, it is intended that improvements located within the settlement area boundaries will be funded through the stormwater levy.

## 8.6 ENVIRONMENTAL MITIGATION RECOMMENDATIONS

During the planning, design, and construction of recommended projects, the potential exists for adverse environmental impacts on the natural features and ecological functions identified within the study area. During the evaluation of servicing alternatives, potential environmental impacts were noted. Assuming appropriate mitigation measures are followed, these impacts will be preventable or minimal to the surrounding environment.

Table 8-2 summarizes typical recommended mitigation and enhancement measures, and suggested application to minimize and mitigate the potentially adverse environmental impacts associated with the Master Plan and any proposed projects where potential for habitat disturbance exists. This information should be used in further planning studies, preparing detailed designs, construction timing, agency approvals, and on-going monitoring to ensure that the natural environment features identified within this report are protected, maintained, and restored through the implementation of any identified projects. Site specific environmental mitigation measures should be addressed during the planning and detailed design of identified projects.

**Table 8-3 Mitigation and Enhancement Measures**

| Potential Impact | Mitigation |
|---|---|
| **Socioeconomic Impacts** | |
| **Archaeological Resources & Built Cultural Heritage/Cultural Heritage Landscapes**<br>• Potential disruption of unidentified archaeological resources during construction.<br>• Potential damage/disturbance to built cultural heritage related to construction activities. | • Prior to ground disturbance, a Phase 1&2 Archaeological Assessment should be conducted onsite to determine archaeological potential. Flexibility has been built into facility recommendations, and it is anticipated that facility footprints can be designed to avoid identified archaeological resources.<br>• It is anticipated that SWM facilities and other improvements will be located away from built cultural heritage resources and cultural heritage landscapes. For potential impact to suspected built cultural heritage and cultural heritage landscapes, a Cultural Heritage Evaluation Report should be conducted to determine presence of significant Built Cultural Heritage resources. |
| **Public Safety**<br>• Potential risks (real and/or perceived) to public safety related to SWM Ponds (ex. drowning, mosquito-borne disease, etc.) | • SWMF to be designed in accordance with best practices in order to mitigate the risk of drowning and other hazards to public safety. |
| **Disturbance from Noise/Vibration/Dust during Construction**<br>• Potential impacts including respiratory issues related to dust inhalation and/or disturbance and damage to structures from loud noise or vibrations | • Construction to occur in accordance with the provisions of the Municipal Noise Bylaw as applicable<br>• For concerns relating to vibration impacts, pre-condition surveys should be conducted prior to construction.<br>• Construction best practices should be utilized to limit dust |

| Potential Impact | Mitigation |
|---|---|
| **Traffic Management & Access**<br>• Disruption to residents and road users associated with road closures/lane reductions during construction of sewers and other SWM infrastructure | • Proponent will co-ordinate short-term road closures and detours per standard construction practices.<br>• Traffic management plans, including staging plans will be prepared during the detailed design stage of each specific project. |
| **Impacts on the Natural Environment** | |
| Recommended SWM Facilities and other improvements identified within this Master Plan are conceptual and additional environmental reviews will be required prior to detailed design. It should be noted that design and construction of SWM facilities should be located outside of designated natural heritage features and incorporate appropriate buffers from natural heritage features.<br><br>A scoped Environmental Impact Study or project screening should be undertaken in order to identify the presence or absence of significant environmental features, confirm the limits of environmental features, and identify appropriate mitigation and/or compensation measures. The general best practices identified below should be considered a baseline and should be refined on a project and site specific basis. | |
| **Terrestrial Resources**<br>• Disturbance/harm to vegetation communities, including SAR, related to the construction and operation of SWM infrastructure (ex. Tree removal, habitat fragmentation, etc.)<br>• Disturbance of migratory birds including damage or destruction of nests and/or habitat. | • Clearly delineate natural heritage features on all project drawings and specifications.<br>• All maintenance activities, vehicle refueling or washing, as well as the storage of chemical and construction equipment should be located >30m from natural areas. In the event of an accidental spill, the MECP Spills Action Centre should be contacted, and emergency spill procedures implemented immediately<br>• Unexpected or accidental vegetation damage and/or removal should result in replacement with native vegetation species<br>• Install, monitor and maintain proper muffling and maintenance of machinery and equipment to mitigate noise impacts to wildlife<br>• Erosion and sediment control structures (i.e., silt fencing) should be installed, monitored and maintained regularly to ensure that they are fully functional with emergency supplies available<br>• Steep slopes (>3:1) should have erosion blankets<br>• Erosion control berms/swales should be located in critical areas to divert flows to the sediment basins<br>• Erosion controls are to be removed only after the soils of the construction area have been stabilized and |

| Potential Impact | Mitigation |
|---|---|
| | adequately protected or until vegetation cover is re-established<br>• All disturbed areas will be revegetated using suitable seed following construction.<br>• Tree removal will be avoided during the breeding bird window (May 1 to July 31).<br>• An avian biologist will be retained to complete comprehensive breeding bird surveys if vegetation clearing is required during the breeding bird window.<br>• Newly created forest edges should be planted with a mix of large woody stock, including trees and shrubs to protect the forest interior from exposure to the sun, wind and invasive species<br>• Stockpiles with slopes greater than2:1 should be avoided in order to prevent the residence of bank swallows (Species at Risk) |
| **Aquatic Resources**<br>• Disturbance/harm to fish and fish habitat related to construction and operation of SWM infrastructure. | • For any works associated with a mapped watercourse, a Self-Assessment in accordance with Fisheries and Oceans Canada requirements should first be completed to identify potential impacts to fish and fish habitat.<br>• Any work along or in the watercourse margins should be timed/scheduled to minimize impacts to fish and mussel species. A review of the activity may assist in negotiating the timing window.<br>• Seek opportunities to enhance riparian vegetation through the planting of hanging grasses, shrubs and trees in order to improve stream cover, reduce temperature impacts, and provide allochthonous inputs (food source for various fish species).<br>• Ensure enhanced erosion control measures are installed and maintained throughout all phases of construction to protect exposed surfaces, control run-off and minimize the deposition of silt or suspended sediments within downstream habitats. |

| Potential Impact | Mitigation |
|---|---|
| **Slope Stability and Erosion Control**<br>• Potential detriment to water quality, water turbidity and slope stability associated with higher flow volumes due to construction of SWM infrastructure. | • Minimize potential for increased flows to receiving areas with known erosion susceptibility through implementation of upstream quantity controls.<br>• Where increase of flows may occur or where slope stability issues exist, implement slope stability measures into detailed design of specific projects.<br>• With respect to construction activities, a sediment and erosion control plan should be prepared during design. Appropriate controls should be implemented prior to ground disturbance and monitored throughout construction. |
| **Impacts of Salt from Road Runoff on Groundwater and Surface Water Sources** | • Salt management plans should be prepared for future developments and as part of the Municipality's road maintenance program in order to reduce salt loading on receiving watercourses and groundwater sources. |

# 9.0 CLASS EA FILING AND PUBLIC REVIEW PERIOD

This Stormwater Master Plan fulfills the planning and documentation requirements for the Schedule B project identified.

This Stormwater Master Plan and supporting documentation has been made available for the minimum 30 calendar day review period starting on August 27, 2020 and ending on October 1, 2020. A Notice of Completion was published in the local newspapers (Middlesex Banner, and Lononer). The Notice was also mailed to the stakeholder list for the study and to those who have expressed interest in the study. Copies of the Master Plan were made available online at www.middlesexcentre.on.ca/stormwater, as well as at the Municipal offices at the address below upon request – due to the uncertainty of COVID-19 restrictions and closures during the review period, alternative arrangements for viewing a physical copy of the report will be made and interested stakeholders are asked to contact Municipal staff to make arrangements to review the physical copy.

Municipality of Middlesex Centre
10227 Ilderton Road, Ilderton, ON
N0M 2A0
519-666-0190
8:30AM-4:30PM, Monday – Friday

# Appendix A CONSULTATION

## A.1 CONTACT LIST

## A.2 NOTICE OF COMMENCEMENT

## A.3 PUBLIC CONSULTATION CENTRES

## A.4 AGENCY COMMENTS

## A.5 PUBLIC COMMENTS

## A.6 ONTARIO PARKS/INFRASTRUTURE ONTARIO CORRESPONDENCES

## A.7 INDIGENOUS CONSULTATION

## A.8 NOTICE OF COMPLETION

# Appendix B FIGURES

## B.1 NATURAL ENVIRONMENT

## B.2 EXISTING DRAINAGE CONDITIONS

## B.3 ALTERNATIVE SOLUTIONS

## B.4 PREFERRED ALTERNATIVES

# Appendix C OFFICIAL PLAN SCHEDULES

# Appendix D EVALUATION OF ALTERNATIVE SOLUTIONS

# Appendix E SUPPLEMENTARY INFORMATION