

## EXECUTIVE SUMMARY

### INTRODUCTION

In recent years, the issue of flooding has increasingly become a major concern in the Town of Tecumseh and the Windsor-Essex Region. Extreme rainfall events in September 2016 and August 2017 each caused significant flooding of local roads, homes, and businesses – with hundreds of reports of flooding received by the Town as a result of each event. In response, the Town of Tecumseh successfully applied for funding through the *National Disaster Mitigation Program* and subsequently commissioned the *Storm Drainage Master Plan* for the northern portion of the Town that was most affected by the flooding. That study was completed in June 2019.

Landmark Engineers was subsequently retained by the Town of Tecumseh in June 2019 to develop a Stormwater Master Plan for the Oldcastle Hamlet area, in the southwest corner of the Town. The drainage infrastructure in this area (also known as the Oldcastle Business Park) has been developed over the years in fragmented manner – generally in response to individual developments, dating back to pre-amalgamation. Given the economic importance of this business park and the drainage issues that are known to exist in the area, an updated, holistic planning approach to stormwater management was deemed to be warranted.

Based on the above, the Landmark Engineers has prepared this *Oldcastle Stormwater Master Plan* on behalf of the Town of Tecumseh. It was the purpose of this report to:

- Inventory, assess, and confirm the capacities of the existing stormwater drainage system;
- Identify and define local drainage issues and areas of concern;
- Review and assess the stormwater management needs for future development;
- Identify and assess potential drainage improvements; and,
- Prepare a prioritized strategy for implementing the proposed drainage improvements.

It should be noted that this *Oldcastle Stormwater Master Plan* has been developed in accordance with the procedures set out in the MEA's *Municipal Class Environmental Assessment*. Although this report has been prepared as a standalone technical document, for broader context and details regarding the accompanying public consultation process, it should be read in conjunction with the *Environmental Assessment (EA) Project File*.

### STUDY AREA / EXISTING DRAINAGE SYSTEM

The study area for this Stormwater Master Plan generally encompasses the Oldcastle Business Park in the southwest quadrant of the Town of Tecumseh, and is generally bounded by Highway 401 to the north and west. The southern and eastern limits of the study area are more variable, but generally extend southerly just beyond Highway 3 and as far east as 9<sup>th</sup> Concession Road.

The current study area is located at the headwaters of three separate watersheds: with stormwater draining westerly toward Turkey Creek; northerly and easterly toward Little River; and southwesterly toward the Canard River. The drainage divide separating these three watersheds consists of a low ridge that generally runs along the Walker Road and Highway 3 rights-of-way.

Stormwater generated from within the study area is generally conveyed to the downstream drainage systems (located within the neighbouring municipalities of Windsor and Lasalle) via local storm sewers, roadside ditches, and open-channel drains. Each of the downstream receiving bodies within the Turkey Creek and Little River watersheds have recently been subject to hydrologic and/or hydraulic analyses via the *Turkey Creek Watershed Study* (ongoing), the *Upper Little River Master Drainage and Stormwater Management Plan* (2017), and the *Little River Floodplain Mapping project* (ongoing). The information compiled via these parallel studies was used to help model the overall drainage system.

## STORMWATER MODELLING METHODS

In order to analyze and assess the performance of the existing (and future) drainage system, Landmark Engineers created a detailed hydrologic and hydraulic model of the study area and its downstream receiving bodies using PCSWMM Professional 2D software. Information from the Town of Tecumseh's Geographic Information System (GIS), archived as-built sewer design drawings, municipal drain reports, and the Ontario Ministry of Natural Resources and Forestry's *LiDAR-Derived Digital Terrain Model* were all used in constructing the model, with hydrologic inputs based on the *Windsor/Essex Regional Stormwater Management Standards Manual* (ERCA, 2018).

The dual-drainage model (incorporating both the minor drainage system of sewers, drains & culverts and the major drainage system of overland surface flow routes) was then calibrated based on actual field observations from five separate flow-monitoring locations during six separate rainfall events over the course of the study - measuring both water levels and flow velocities. The model's hydrologic and hydraulic parameters were carefully adjusted to validate the predicted water levels and flows - accounting for variables such as: the antecedent moisture condition in the soil; and the level of overgrowth/vegetation in the primary drains.

## EXISTING DRAINAGE ISSUES

In identifying problems with the existing system, it was noted that the current drainage infrastructure within the study area was generally designed and constructed to a lesser standard than that which would be prescribed today. While perhaps not ideal, these systems can still provide an adequate level-of-service in conveying stormwater from most rainfall events. It was also noted that a full upgrade of the system to conform with modern standards would be highly impractical, disruptive and expensive.

Thus, rather than focusing on strict compliance with current standards, the model constructed for this Stormwater Master Plan was first used to identify and address the parts of the existing stormwater system that are significantly undersized and have deficient drainage capacity – where frequent and prolonged nuisance ponding will typically result.

Based on our review of the drainage model, our observations in the field, and our consultations with both local residents and Town of Tecumseh maintenance staff, existing drainage problems were identified at the following locations:

- Deficient drainage capacity has been noted in the minor drainage system (i.e., sewers, culverts & open drains) along Fasan Drive, Blackacre Drive (particularly near the intersection with Outer Drive), Halford Drive, Webster Drive, Del Duca Drive and Ure Street;

- The existing culvert on the Wolfe Drain crossing Outer Drive and the drain section along Outer Drive are substantially undersized, limiting outflow capacity for the entire upstream subwatershed (approx. 233 hectares);
- The open-channel segment of the Wolfe Drain immediately downstream of the Outer Drive culvert is excessively steeply graded, resulting in significant erosion and downcutting due to high flow velocities;
- A low-lying road sag was noted on Blackacre Drive just east of Outer Drive, resulting in frequent ponding due to the above-noted drainage deficiencies;
- Heavy brush, overgrowth and sediment accumulations have been noted on the Hurley Relief Branch Drain and on the Washbrook Drain, substantially restricting their flow capacities;
- Substantial sediment accumulations and standing water have been noted on the culvert enclosure of the 6<sup>th</sup> Concession Drain between North Talbot Road and the Highway 401 corridor;
- Castlewood Court has been observed to be very slow to drain, likely due to a suspected blockage in the culvert enclosure feeding the Wolfe Drain; and,
- Frequent and prolonged nuisance ponding has been observed at many locations within the study area (including Fasan Drive, Blackacre Drive, Del Duca Drive, Ure Street, and Oldcastle Road) due to blockages in the driveway access culverts along the roadside ditches.

In addition to the above, our review of the dual-drainage model for the study area revealed the following deficiencies with the major (i.e., overland) storm drainage system for conveying infrequent heavy storm events within the study area:

- Roadway sags lacking a proper overland flow outlet were identified along Fasan Drive, Blackacre Drive, Halford Drive, Webster Drive, Del Duca Drive, Ure Street, Dumouchelle Street, Moro Drive, Rossi Drive, Roscon Drive, Olympia Drive, Brendan Lane, and DiCocco Court;
- The existing Wolfe Drain along Outer Drive and east of Walker Road does not have sufficient capacity to convey stormwater from a 100-year flow event;
- The existing cross-section of the Washbrook Drain between North Talbot Road and 9<sup>th</sup> Concession Road does not have sufficient capacity to convey stormwater from a 100-year flow event; and,
- The existing roadside drain along North Talbot Road between Weston Park and 9<sup>th</sup> Concession Road does not have sufficient grade and is very slow to drain.

## RECOMMENDED DRAINAGE IMPROVEMENTS

In order to address the known issues with the existing stormwater system (as outlined above), the following drainage improvements are recommended:

- New storm sewers along Fasan Drive, Blackacre Drive, Del Duca Drive, Ure Street, Castlewood Court and Oldcastle Road;
- Wolfe Drain improvements, including:
  - a new auxiliary Wolfe Drain, combined with storage via a new Blackacre Pond;
  - a 1200mm-diameter enclosure of the Wolfe Drain along Outer Drive;
  - replacement of the storm sewer immediately east of Walker Road; and,

- remedial works along the steep segment of the Wolfe Drain between Outer Drive and Highway 401;
- Deepening of the Collins Drain from Outer Drive to the Fasan Drive storm sewer outlet, combined with storage via a new Collins Pond - including replacement of all affected culverts;
- Replace (enlarge) existing storm sewer outlets to Wolfe Drain for Moro Drive, Rossi Drive, Olympia Drive and Brendan Lane;
- Replace (enlarge) existing storm sewer outlet to 6<sup>th</sup> Concession Drain for Halford Drive;
- Replace and re-route the Hurley Relief Branch Drain enclosure to a new Hurley Pond located along the south side of the railway;
- Washbrook Drain improvements, including:
  - immediate maintenance to remove blockages; and,
  - replacement of culvert through Weston Park;
- New Washbrook-Downing Pond to attenuate flows from Washbrook Drain, immediately upstream of the North Talbot Road crossing;
- Demonte Drain improvements, including:
  - replacement of existing storm sewer and culverts;
  - cleaning of the open-channel segments of the drain, as required to provide a reasonable level of service; and,
  - the establishment of a new overland flow route toward the 8<sup>th</sup> Concession Drain;
- Establish/secure/maintain overland flow routes at specific locations.

## STORMWATER MANAGEMENT FOR FUTURE DEVELOPMENTS

In order to address the stormwater management needs for future developments within the current study area, the stormwater ponds noted above (i.e., the Oldcastle Heights Pond, the Downing Acres Pond, and the 9<sup>th</sup> Concession Pond) have all been sized to address both the stormwater quality and quantity requirements of the adjacent designated development blocks on a regional scale. Other large undeveloped areas within the study area will require individual stormwater management plans to address these requirements as set out in the *Windsor/Essex Region Stormwater Management Standards Manual* (ERCA, 2018).

For new infill developments located within the existing built-up sections of the study area, a set of simplified stormwater management criteria have been established as part of the overall study. These criteria establish clear and concise storage volume and release rate requirements for 4 separate categories of infill developments, based on the practical objective of not adversely impacting the existing drainage conditions.

## ESTIMATED COSTS & IMPLEMENTATION

Based on the outcomes of our drainage model assessments, we recommend that the following measures be implemented to address the known drainage issues, and facilitate development within the study area:

Short-Term Improvements: \$5.8 Million

We recommend that the Town endeavor to complete the following improvements as soon as possible - preferably within a 1- to 2-year timeframe:

Project ID	Project Description	Planning and Approval Process	Watershed	Subwatershed	Preliminary Budget Cost Estimate <sup>1</sup>
W.1	Wolfe Drain Improvements	Drainage Act	Turkey Creek	Wolfe Drain	\$3,550,000
8C.1	Demonte Drain Improvements	Drainage Act	Little River	9th Conc. Drain	\$100,000
H.1	Hurley Relief Branch Drain Improvements	Drainage Act	Little River	Hurley Drain	\$50,000
H.2	New Storm Sewer along Del Duca Drive	Schedule B	Little River	Hurley Drain	\$1,000,000
H.3	New Storm Sewer along Ure Street	Schedule B	Little River	Hurley Drain	\$450,000
9C.1	Washbrook Drain Improvements	Drainage Act	Little River	9th Conc. Drain	\$620,000

Medium-Term Improvements: \$11.2 Million

We recommend that the Town endeavor to complete the following improvements within a 10-year timeframe, or in conjunction with planned sanitary sewer improvements for the affected roadways:

Project ID	Project Description	Planning and Approval Process	Watershed	Subwatershed	Preliminary Budget Cost Estimate
W.2	Collins Drain Improvements	Drainage Act	Turkey Creek	Wolfe Drain	\$1,130,000
W.3	New Storm Sewer along Fasan Drive	Schedule B	Turkey Creek	Wolfe Drain	\$1,340,000
W.5	New Storm Sewer along Blackacre Drive	Schedule A	Turkey Creek	Wolfe Drain	\$1,870,000
W.6	Replace Storm Outlets to Wolfe Drain	Schedule B	Turkey Creek	Wolfe Drain	\$1,080,000
6C.1	Replace Halford Drive Storm Outlet	Schedule B	Little River	6th Concession Drain	\$60,000
7C.1	New Storm Sewers along O'Neil Dr. & Moyhanan St.	Schedule A	Little River	7th Concession Drain	\$230,000
H.4	Enlarge & Re-route Hurley Drain to New Hurley Pond	Schedule B	Little River	Hurley Drain	\$3,320,000
9C.2	New Washbrook-Downing Pond	Schedule B	Little River	9th Concession Drain	\$2,200,000

Long-Term Improvements: \$6.4 Million

We recommend that the Town endeavor to complete the following improvements within a 20-year timeframe, or in conjunction with planned sanitary sewer improvements for the affected roadways:

Project ID	Project Description	Planning and Approval Process	Watershed	Subwatershed	Preliminary Budget Cost Estimate
7C.2	New Storm Sewer along Hennin Street	Schedule A	Little River	7th Concession Drain	\$370,000
9C.3	New Storm Sewer along Oldcastle Road, Castlewood Court and O'Neil Drive	Schedule A	Little River	9th Concession Drain	\$1,880,000
9C.4	Extension of Washbrook Drain Enclosure	Drainage Act	Little River	9th Concession Drain	\$4,170,000

Development-Driven Works: \$8.6 Million

The following projects are stormwater ponds which serve to address stormwater management requirements of future development:

Project ID	Project Description	Planning and Approval Process	Watershed	Subwatershed	Preliminary Budget Cost Estimate
9C.5	Oldcastle Heights Pond	Schedule B	Little River	9th Concession Drain	\$1,310,000
9C.6	Downing Acres Pond	Schedule B	Little River	9th Concession Drain	\$1,630,000
9C.7	9th Concession Pond	Schedule B	Little River	9th Concession Drain	\$5,660,000