

Memo

To: Town of Caledon
From: Aaron Farrell/Gurkanwal Arora
Date: February 25, 2019
File: TPB166090
Re: **Class Environmental Assessment for the Construction of Spine Road Interchange at Highway 410 (Mayfield West Phase 2), Town of Caledon**

1. Introduction

As requested by the Town of Caledon, we have completed a review of the existing drainage and stormwater management system within the Hurontario Street/Valleywood Boulevard/Highway 410 Interchange, and have completed a high-level assessment of the requirements and opportunities to provide a conceptual stormwater management plan for the proposed reconstruction at the interchange to accommodate the east-west Spine Road. The following has been prepared to summarize the findings and recommendations from this assessment, as well as to provide general guidance for future studies and analyses to be completed in support of the detailed design for the interchange.

2. Background Information

The following background information has been provided for reference in developing the stormwater management plan for the proposed interchange.

- As-Built Contract Drawings, Contract No. 2007-2264. Book 1: Sheets 39 to 57, Book 2: Sheet 133, Quantities – Pipe Culverts: Sheets 49 to 58 (Giffels, 2007).
- Detailed Analysis of The Storm Drainage System for The Valleywood Subdivision (Andrew Brodie Associates Inc., October 1989).

In addition to the foregoing information, Wood has also used available topographic mapping and aerial photography to verify, at a high level, various components of the existing drainage system.

Wood had also requested the stormwater management report and accompanying hydrologic and hydraulic models for the existing Highway 410 and interchange, for use and reference in evaluating stormwater management alternatives and establishing a preferred option as part of this Class



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Environmental Assessment. Based upon responses provided by the Town of Caledon and MTO, it is understood that this information is not available, hence has not been provided.

3. Characterization of Existing Conditions

The existing drainage conditions have been characterized based upon the information in the as-built drawings of the Highway 410 interchange provided for this study. A drainage mosaic of the existing conditions has been developed, which summarizes the drainage and stormwater management plan for the existing Highway and interchange. The drainage mosaic is presented in Figure 1. The contributing drainage areas to the existing drainage system includes the Highway 410, Valleywood Boulevard, Hurontario Street, Hutchinson Farm Lane, and the associated highway ramps. There are existing residential lands to the north, south and east of the site, and agricultural lands to the west of the site, however these areas do not contribute to the drainage system along the Highway or within the interchange.

As indicated by the information in Figure 1, the existing drainage system within the interchange is comprised of roadside ditches, culverts, and storm sewer systems. The drainage system conveys all runoff toward the existing wet pond stormwater management (SWM) facility, which discharges to the Etobicoke Creek via a 1200 mm diameter sewer (approximately 750 m in length). The total drainage area to the existing SWM facility is approximately 31 hectares with an impervious coverage of 21%. Although no information has been provided regarding the design criteria for the stormwater management facility, it is anticipated that the existing facility provides stormwater quality control to an *Enhanced* (i.e. 80% TSS removal) standard of treatment, based upon the vintage of the stormwater management facility and Wood's experience within the Etobicoke Creek Watershed as part of other studies. Furthermore, it is anticipated that the existing stormwater management facility provides some form of stormwater quantity control, likely associated with the conveyance capacity of the 1200 mm diameter storm sewer at the SWM facility outlet.

The total area of paved (i.e. impervious) surface contributing to the existing drainage and stormwater management system is summarized in Table 1.

Table 1. Existing Paved Areas (m²)		
Number	Description	
1	Hurontario Street and Valleywood Boulevard existing	13563
2	S-N loop on ramp	5500
3	S-E on Ramp	2153
4	N-E/W/S off-ramp	4417
5	E-N/S off-ramp	1480
6	Hutchinson Farm Lane	8010
7	Existing Highway 410 Mainline	30580
	Total:	65703

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4. Overview of Proposed Conditions

The works associated with the proposed Spine Road/Highway 410 Interchange include the addition of the new Spine Road, reconstruction of the N-E/W/S Ramp S/E-N Ramp, realignment of Hurontario Street and Valleywood Boulevard, realignment of the S-E Ramp, and removal of the Hutchinson Farm Lane. As part of the proposed works, the drainage system within the interchange would be modified to include new culverts, and is proposed to provide rural drainage (i.e. ditches or swales) adjacent to the new roadways. The total paved (i.e. impervious) surface resulting from the proposed works are summarized in Table 2.

Table 2. Proposed Paved Areas (m²)		
Number	Description	
1	Hurontario Street and Valleywood Boulevard realignment	24184
2	Maintain exist S-N on-ramp	5500
2A	New single lane S-E/N on-ramp	6690
3	New single lane N-E on-ramp	3555
4	New single lane S-E on-ramp + exist to remain	5170
5	Realignment of existing N-E/W/S off-ramp	4882
6	Additional left turn lane for E-N/S off-ramp + exist to remain	1298
7	Hutchinson Farm Lane (removed)	0
8	Existing Highway 410 Mainline	30580
	Total:	81859

The information in Table 2 indicates that the proposed road works would be anticipated to result in a total paved surface area of 81,859 m². Compared with the information presented in Table 1, this represents an additional 16,156 m² of paved surface, compared to existing conditions, and a corresponding increase in impervious coverage from 21% to 26%.

5. Conceptual Stormwater Management Plan

5.1 Stormwater Management Criteria

The stormwater management requirements for the proposed interchange have been established based upon on the guidance provided in the Mayfield West Phase 2 Secondary Plan Comprehensive Environmental Impact Study and Management Plan (AMEC et. al., December 2014), as well as general criteria applied for the planning and design of drainage and stormwater management infrastructure as part of other road and highway projects. The following criteria have been applied to develop a conceptual stormwater management plan:

- Provide stormwater quality control to an *Enhanced* (i.e. 80% TSS removal) level of treatment as per the Stormwater Management Planning and Design Manual (MOE, March 2003) design criteria.

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- Quantity controls to be provided, as required, to address capacity constraints of receiving conveyance infrastructure; due to the location of the proposed works within the Etobicoke Creek Watershed, and based upon the findings of the December 2014 Mayfield West Comprehensive Environmental Impact Study and Management Plan, it is anticipated that quantity controls are not required to reduce peak flows along the Etobicoke Creek Main Branch.

In addition to the foregoing, it is recognized that drainage infrastructure (i.e. sewers, ditches, culverts) are required to address hydraulic design criteria. The sizing of this infrastructure is to be completed as part of the detailed design process, and supported by hydrologic and hydraulic modelling and analyses accordingly.

5.2 Conceptual Stormwater Management Plan Components

A conceptual stormwater management plan has been developed for the proposed works at the Spine Road/Highway 410 Interchange, which would address the above criteria. The conceptual stormwater management plan is presented in Figure 2. Details of the conceptual stormwater management plan are summarized below.

5.2.1 Quality Control

As noted previously, the proposed works would result in an additional 16,156 m² of pavement area compared to existing conditions. Stormwater quality controls for the additional paved area may be provided through the implementation of enhanced grassed swales adjacent to the realigned road surfaces. Additional opportunities to provide an enhanced level of stormwater quality control are available through the expansion of the existing wet pond SWM facility, to incorporate a permanent pool volume within the candidate locations identified in Figure 2. Preliminary calculations indicate that a permanent pool volume of approximately 700 m³ would be required to address the stormwater quality requirements of the additional pavement, based upon the MOE 2003 SWM Guidelines for wet pond SWM facilities. It is estimated that the additional storage area within the S-N ramp loop would provide a permanent pool volume of up to 3050 m³, hence the stormwater quality requirements for the additional paved surface would be addressed by the stormwater quality plan presented in Figure 2.

5.2.2 Quantity Control

As noted above, the stormwater management plan for the proposed works would be required to address capacity constraints from existing drainage infrastructure. The existing stormwater management facility discharges to Etobicoke Creek via a 1200 mm diameter storm sewer at 0.50% slope. Therefore, the existing storm sewer outlet has a full flow capacity of approximately 2.88 m³/s.

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It is anticipated that the quantity control volume provided within the existing stormwater management facility would need to be increased in order to provide the requisite quantity control for the total paved surface resulting from the proposed works, to control the 100 year peak flow to the capacity of the 1200 mm diameter pipe. The following three (3) candidate locations where additional storage can be provided for stormwater quantity control:

- Alternative 1: within the S-N ramp loop,
- Alternative 2: between the proposed N-E and S-E ramps, and
- Alternative 3: within the area enclosed by the N-E ramp loop west of Valleywood Boulevard

The conceptual stormwater management plan presented in Figure 2 has identified Alternative 1 as the preferred location, as it can be most readily accommodated by incorporating an equalization culvert within the interchange ramp, between the existing facility and the expansion. Nevertheless, all three locations noted above are considered to provide ample opportunity for addressing the quantity control requirements associated with the proposed expansion of the interchange and realignment of the adjacent roads.

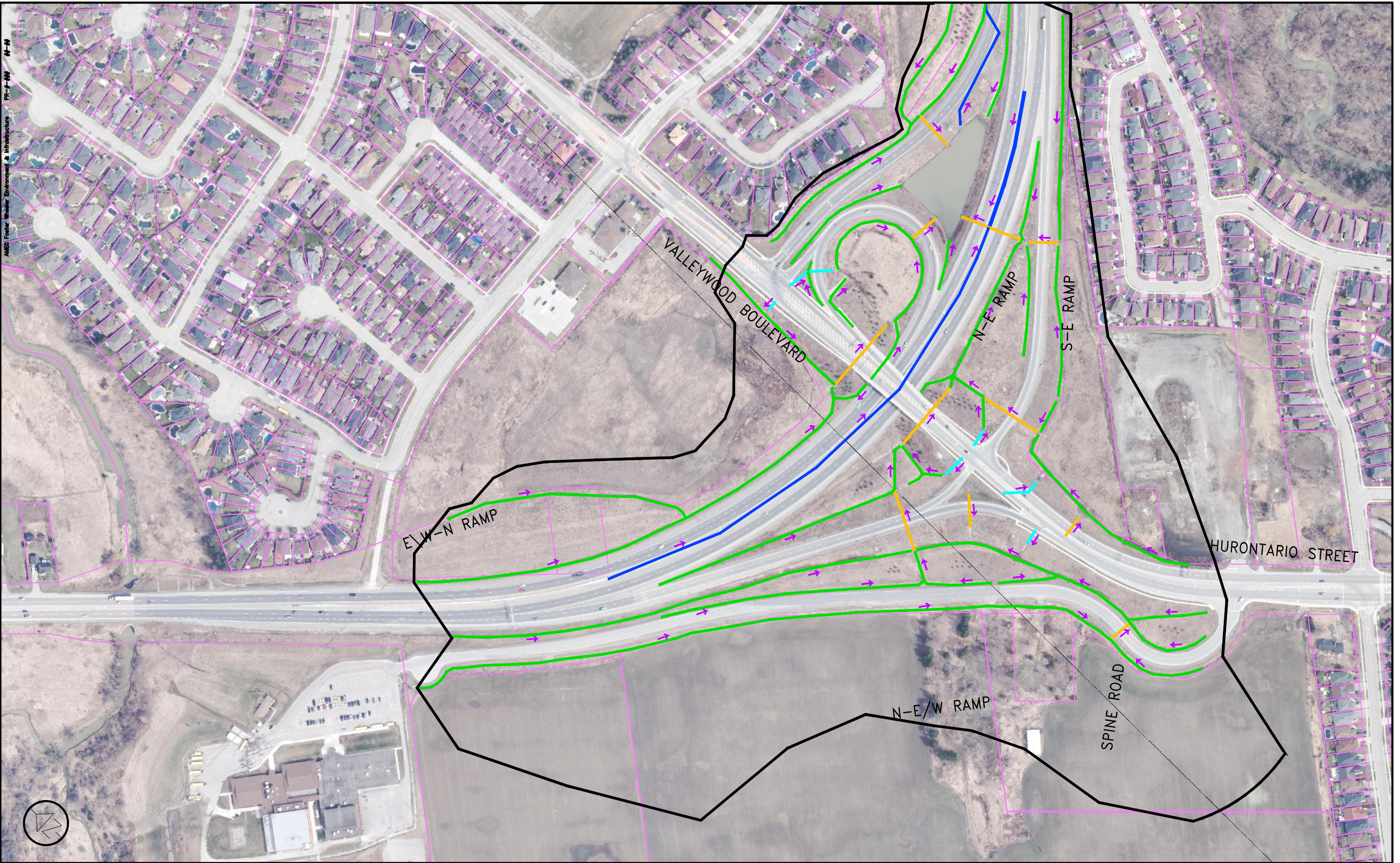
6. Conclusions and Recommendations

Based upon the foregoing, it is concluded that:

1. The proposed works associated with the Spine Road/Highway 410 Interchange would result in an additional 16,156 m² of paved surface (i.e. 5% increase in imperviousness).
2. Stormwater management for the proposed works would be required to provide and *Enhanced* level of stormwater quality control for the proposed works, as well as to address conveyance capacity constraints of existing drainage infrastructure.
3. The conceptual stormwater management plan provided herein provides opportunities to address the stormwater management requirements for the proposed works.

It is recommended that the conceptual stormwater management plan be advanced for further assessment and refinement as part of the next stages of planning and design for the interchange. It is further recommended that supporting hydrologic and hydraulic analyses be completed at the next stages of planning and design for the interchange, to establish the storage requirements for the stormwater management facility, as well as to verify the conveyance capacity and hydraulic grade line of the 1200 mm diameter pipe at the outlet under existing and proposed conditions. The assessment should necessarily include supporting hydrologic and hydraulic analyses for the swales and culverts, to verify that all hydraulic structures satisfy current criteria for freeboard and flood protection of the roadways.

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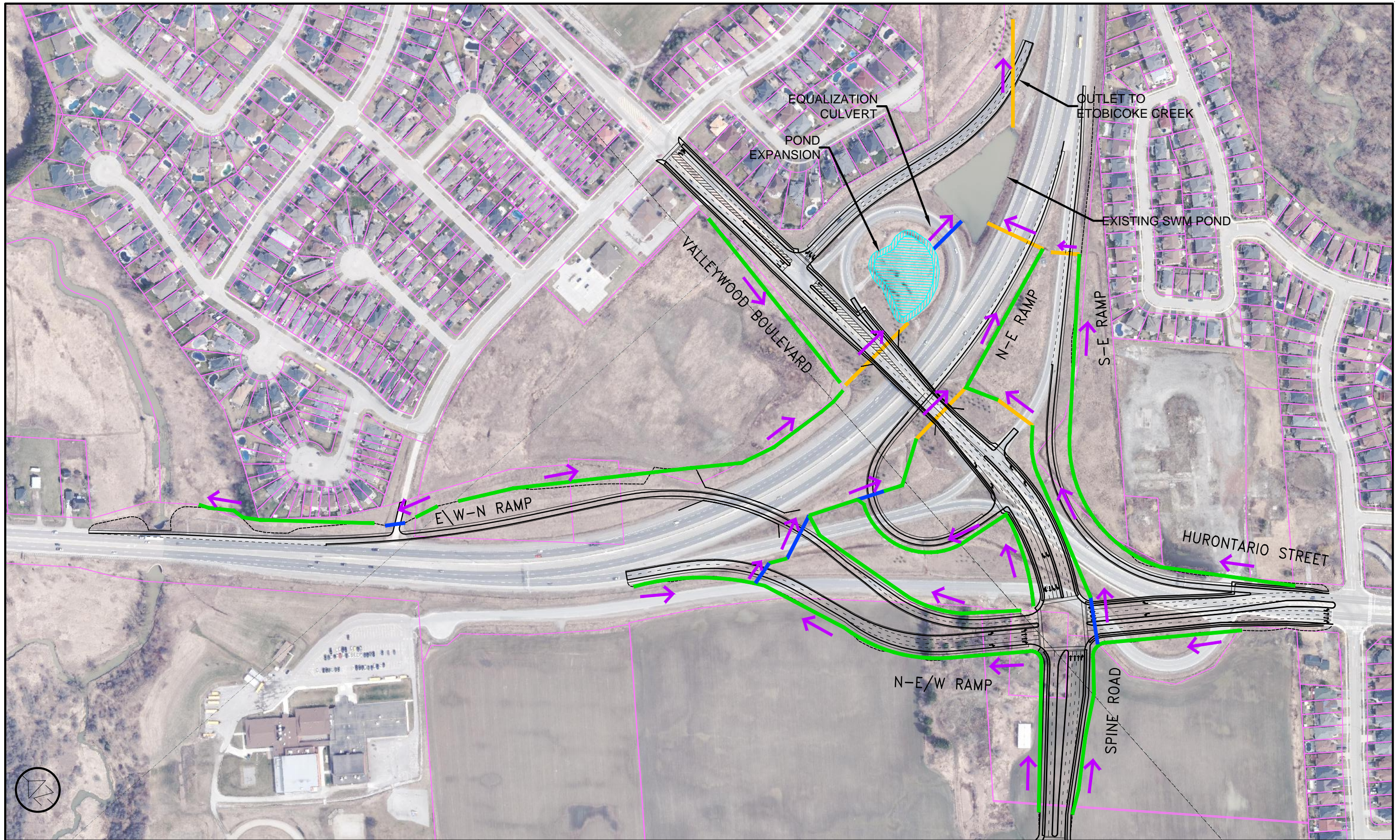
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|--|--|--|
|  DITCH/ ENHANCED SWALES |  EXISTING CULVERT |  CATCHBASIN |
|  FLOW DIRECTION |  STORM SEWER | |

**HIGHWAY 410 INTERCHANGE
SPINE ROAD
TOWN OF CALEDON**

**DRAINAGE MOSAIC
(EXISTING CONDITION)**

Consultant File No. TPB166090
Figure No. 1





HIGHWAY 410 INTERCHANGE
 SPINE ROAD
 TOWN OF CALEDON

CONCEPTUAL DRAINAGE
 AND STORMWATER
 MANAGEMENT PLAN

Consultant File No. TPB166090
 Figure No. 2



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- DITCH/ ENHANCED SWALES
- EXISTING CULVERT
- FLOW DIRECTION
- NEW CULVERT