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163 & 164 Edward Street East, Creemore

FLOOD HAZARD ASSESSMENT

Lamb Creemore Inc.

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Document Control

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1 Introduction

Tatham Engineering (Tatham) has been retained by Lamb Creemore Inc. to complete a flood hazard assessment in support of the proposed development at 163 & 164 Edward Street East in Creemore, Township of Clearview. This study is being completed to review the proposed development in the context of the NVCA's 2D HEC-RAS hydraulic model of the Mad River and the Township's East Creemore Drainage Study to ensure the development can be safely floodproofed without increasing flood risks for surrounding properties.

1.1 SITE DESCRIPTION

The subject site is bounded by existing cultivated land to the north, east, and south, and undeveloped land (future residential development) to the west. The site consists of two parcels: the northern parcel at 164 Edward Street East and the southern parcel at 163 Edward Street East. The site is located within the NVCA's Regulated area potentially subject to flood hazards associated with the Mad River and the Edward Street Tributary of the Mad River. For details on the proposed site development, refer to the Functional Servicing Report prepared by Tatham and submitted under separate cover.

1.2 BACKGROUND AND GUIDANCE DOCUMENTS

This document has been prepared in accordance with the following background documents/drawings:

- *Township of Clearview Official Plan (*May 2024*);*
- *NVCA Natural Hazards Technical Guide* (December 2013)*;*
- *East Creemore Drainage Study Drawings – Re-Issued for 30% Review.* RJ Burnside & Associates Limited (August 2025);
- *East Creemore Drainage Study, Community of Creemore, Clearview Township Municipal Class Environmental Assessment (Schedule B) Project File Report for Works Undertaken Within a Watercourse for the Purpose of Flood Control - Addendum.* RJ Burnside & Associates Limited *(*September 2024*);*
- *Functional Servicing & Preliminary Stormwater Management Report*. Crozier Consulting Engineers (April 2023); and
- *Upper Mad River Flood Hazard Mapping Hydraulic Modelling Report.* Aquafor Beech Limited (March 2024).

Additional Information regarding key background documents is provided in the following sections. Additionally, Terms of Reference for this analysis were previously prepared in consultation with the NVCA. These Terms of Reference are included in Appendix A for reference.

1.2.1 Upper Mad River Flood Hazard Mapping Hydraulic Modelling Report

In 2024, the NVCA published the *Upper Mad River Flood Hazard Mapping Draft Hydraulic Modelling Report* (Aquafor Beech) which included a HEC-HMS hydrologic model of the Mad River and a new 2D hydraulic model of the Mad River through Creemore. The 2D model provides more detailed information regarding the Mad River floodplain through Creemore and identifies the overbank flooding as impacting the subject site.

1.2.2 Township of Clearview Official Plan

The site is located within the Mad River Hazard lands designated as Specific Policy Area 13.2.1 as defined in the *Township of Clearview Official Plan*. As per the Official Plan, a two-zone floodplain management concept shall be used for the lands within Specific Policy Area 13.2.1. The floodway and flood fringe are defined as follows in the Official Plan:

a) *the floodway, which shall refer to the contiguous inner portion of the floodplain, representing the area required for the safe passage of flood flow or the area where flood depths and velocities are considered to be such that they pose a potential threat to life or risk of property damage, and which shall be defined as any area within which one of the following criteria is exceeded:*
    (i) a maximum flooding depth of 0.3 metres;
    (ii) *a maximum flooding velocity of 1.7 m/s; or*
    (iii) *a maximum combined depth–velocity product of 0.4 m^2/s.*
b) *the flood fringe, which shall refer to the outer portion of the floodplain, being the area situated between the floodway and the flooding hazard limit, and which shall be defined as the portion of the floodplain in which none of the maximum values specified in Clause 13.2.1.1(a) is exceeded.*

1.2.3 East Creemore Drainage Study Addendum

In 2024, the *East Creemore Drainage Study Addendum* (R.J. Burnside & Associates Limited) was prepared as an addendum to the *Community of Creemore, Clearview Municipal Class Environmental Assessment* (R.J. Burnside, July 2010) to review the drainage options proposed in the 2010 study and update as necessary based on changes within the study area since completion of the 2010 study. The addendum considered the proposed development at 163 and 164 Edward Street East (and other neighbouring developments) and included updated

hydrologic, hydraulic, environmental, and cost analyses to identify the preferred drainage solution, summarized as follows:

- Construct a 1200 mm diameter storm sewer on Concession 3 from Edward Street to Nottawasaga 6/7 Sideroad;
- Ditch improvements along the west side of Concession 3 right-of-way (ROW) from Edward Street to Nottawasaga 6/7 Sideroad;
- An outlet channel from the terminus of the Concession 3 roadway to the Mad River within the existing Municipal ROW;
- Construct a ditch along the north side of the Edward Street ROW. Property acquisition is required;
- Upgrade of the Edward Street E north driveway culverts;
- Relocation and replacement of a culvert to cross the north Edward Street E ditch south into the proposed 187 and 237 Edward Street East channel; and
- A drainage channel through 187 and 237 Edward Street East. The easement is anticipated to be 25 m wide.

The preferred solution described above is illustrated on Figure 5 provided in Appendix A for reference. The preferred solution was considered in the pre- and post-development hydraulic analyses completed for this report in support of the proposed development at 163 & 164 Edward Street East.

2 Hydrologic Analysis

The hydrologic model from the *Upper Mad River Hydraulic Modelling Report* (Aquafor Beech 2024) was compared against the *East Creemore Drainage Study Addendum* (RJ Burnside & Associates Limited 2024) to verify the inflows used for the Edward Street Tributary in the NVCA's 2D HEC-RAS hydraulic model.

2.1 BACKGROUND REPORTS

2.1.1 Upper Mad River Hydraulic Modelling Report

As part of the hydrologic analysis for the Upper Mad River Hydraulic Modelling Report (Aquafor Beech), a model was developed using HEC-HMS hydrologic modelling software. Simulations were performed for the 1:2-year through 1:100-year design storms and the Regional (Timmins) storm. This report was prepared to assess the Mad River floodplain through Creemore and includes flows from the Edward Street Tributary.

The hydrologic model was calibrated using three rainfall events. Calibration reduced flows by approximately 24% for the Regional (Timmins) storm.

2.1.2 East Creemore Drainage Study Addendum

The hydrologic analysis of the Edward Street Tributary prepared for the *East Creemore Drainage Study Addendum* (R.J. Burnside & Associates Limited) was completed using PCSWWM watershed modelling software. Simulations were performed for the 1:5-year, 1:25-year, and 1:100-year return frequency design storms and the Regional (Timmins) storm.

2.2 HYDROLOGY COMPARISON – EDWARD STREET TRIBUTARY

Table 1: Background Hydrologic Peak Flow Comparison

BACKGROUND REPORT	DRAINAGE AREA TO EDWARD STREET EAST (ha)	REGIONAL (TIMMINS) PEAK FLOW (m^3/s)
Upper Mad River Hydraulic Modelling Report	257	10.10
East Creemore Drainage Study	225	11.00

The Regional (Timmins) peak flows from the *Upper Mad River Hydraulic Modelling Report* were used for this analysis for both the Mad River and the Edward Street Tributary. Although the peak flow modelled in the *Upper Mad River Hydraulic Modelling Report* is slightly lower than the *East*

Creemore Drainage Study Addendum despite accounting for a larger drainage area, a review of both catchment delineations confirmed that the drainage area represented in the Upper Mad River hydrologic model is appropriate. Additionally, the Upper Mad River hydrologic model has been calibrated and is believed to provide more representative peak flows for the watershed. Relevant hydrology excerpts from the background reports are provided in Appendix B for reference.

3 Hydraulic Analysis

The 2D HEC-RAS model developed for the *Upper Mad River Flood Hazard Mapping Draft Hydraulic Modelling Report* was used as the basis for the hydraulic analysis for this study. To improve the accuracy of the 2D HEC-RAS hydraulic model for this study, the following updates were made:

- The Manning's roughness coefficient layer for roadways was reduced from 0.05 to 0.02 to better reflect roughness for paved surfaces;
- The model terrain was updated to incorporate the development at 121 Mary Street, as the LiDAR DTM in the original terrain did not reflect final site grading (completed 2025). The grading plan used for this update is enclosed in Appendix A for reference; and
- The 2D mesh was refined through 121 Mary Street and along Edward Street East to provide more detailed modeling of the site and surrounding area.

For the purpose of this analysis and as described in the Terms of Reference included in Appendix A, we are assessing the flood hazards under pre-development conditions which include the works proposed through the East Creemore Drainage Study, and post-development conditions which adds the proposed development to the pre-development condition.

3.1 PRE-DEVELOPMENT CONDITIONS

The pre-development hydraulic model was updated to include the proposed East Creemore Drainage Study (ECDS) works. To refine the 2D HEC-RAS model and incorporate the proposed ECDS works, the following updates were made:

- The pre-development 2D HEC-RAS hydraulic model terrain was adjusted to include the proposed ECDS ditching and the Tribute Channel;
- The model geometry was updated to include the proposed ECDS storm sewer and culverts along Concession Road 3 and Edward Street East;
- The Manning's roughness layer was updated to reflect the ECDS proposed drainage swales/ditches (0.035); and
- The 2D mesh was refined to better represent the Tribute Channel and ECDS ditching. Background drawings for the ECDS ditching and the Tribute Channel are provided in Appendix A for reference.

The LiDAR DTM in the NVCA's 2D model references the CGVD2013 datum, however, the grading design for the proposed ECDS works references the CGVD28 datum. Therefore, a

datum comparison was completed, and the design grading for the ECDS works was adjusted by a factor of -0.36 m to be consistent with the NVCA's hydraulic model geometry (CGVD2013 Datum). Details regarding the datum comparison are provided in Appendix C for reference.

3.1.1 Pre-Development Flooding Conditions

Due to differences in the size and time to peak of the Edward Street Tributary and Mad River watersheds, the flooding associated with the Mad River occurs significantly later than the flooding associated with the Edward Street Tributary. The peak flow in the Mad River occurs approximately 40 hours after the peak in the Edward Street Tributary. The flooding conditions for the Edward Street Tributary and the Mad River spill are summarized below. The Pre-Development Conditions Flood Hazard Plan (Drawing FH.1) is enclosed and should be referenced when reviewing this section.

- Flow from the Edward Street Tributary is conveyed south through the 15 m bottom-width channel constructed as part of the Tribute Development (POI A);
- The flow in the Edward Street Tributary splits at Edward Street E, with a portion conveyed south through the 1200 mm diameter storm sewer (POI C) and the remaining flow conveyed east through the Edward Street East roadside ditch (POI B). The 1,200 mm dia. storm sewer conveys flow along Concession 3 where it eventually discharges to the Mad River via the ditch along the Concession 3 road allowance (POI L);
- Flow conveyed east along Edward Street E crosses Edward Street E via a 1,500 mm dia. CSP culvert crossing, and is then conveyed by the ECDS channel toward Airport Road (POI D);
- The Mad River spill flows through the Village of Creemore toward the subject property from the west (POIs N & O);
- A portion of the Mad River spill passes through 101 Edward Street East and continues east through 163 Edward Street East (POIs F & G); and
- The Mad River spill overtops Concession Road 3 and flows east toward 163 Edward Street East and southeast toward Sideroad 6/7 (POIs F & I).

Pre-development peak flows at Points of Interest (POI) are summarized in Table 2.

Table 2: Pre-Development Peak Flow Summary

POINT OF INTEREST (POI)	PRE-DEVELOPMENT PEAK FLOW (m^3/s)	
	EDWARD STREET TRIBUTARY	MAD RIVER SPILL
(A) Tribute Channel	10.10	0.00
(B) Edward Street East ROW at 163/164 Edward Street East	7.33	3.95
(C) 1,200 mm Ø STM Per ECDS 30% Design	2.77	0.56
(D) ECDS Channel at Edward Street East Culvert Crossing	5.21	3.71
(E) ECDS Channel at Airport Road	6.96	5.62
(F) 163 Edward Street East West Property Line	0.07	8.53
(G) 163 Edward Street East South Flow Path	0.04	5.35
(H) South Portion of 2108 County Road 42	0.24	16.62
(I) South Portion of 3141 Concession Road 3	0.21	24.43
(J) Flow Along West Side of Airport Road	4.50	3.53
(K) Flow Across Sideroad 6/7 Between Airport Road and Concession Road 3	0.00	14.25
(L) ECDS Mad River Outlet	2.47	10.91
(M) Flow Across Sideroad 6/7 at Airport Road	4.33	21.05
(N) Edward Street East ROW West of 101 Edward Street East	0.00	11.75
(O) Edward Street East ROW at 101 Edward Street East	0.00	2.40

3.1.2 Pre-Development Floodway Criteria

Maximum pre-development depth, velocity, and depth-velocity product from the HEC-RAS hydraulic model were compared to the floodway criteria for the Mad River Hazard Lands Specific Policy Area 13.2.1, as shown on Figures 1 to 3 in Appendix C. These figures show a few isolated areas where one or more of the floodway criteria are exceeded. However, it is our opinion these

areas should not be mapped as floodway. In accordance with the Provincial Policy Statement and the Ministry of Natural Resources *Technical Guide: River & Stream Systems – Flooding Hazard Limit*, the floodway is the main, contiguous part of the floodplain needed to safely convey flood flows, or the area where flooding conditions pose a danger to people or property. Small, disconnected areas that exceed a criterion but are not part of the continuous flow area should therefore not be delineated as floodway.

The MNR technical guide provides further guidance on delineation of the floodway and flood fringe through an encroachment analysis approach to allow for a more equitable application of the two-zone concept. Through the proposed conditions analysis presented herein, the encroachment of the proposed development is assessed and measures to mitigate negative impacts to flood conditions are identified demonstrating development in this portion of the floodplain is aligned with the intent of the two-zone policy to limit development to the flood fringe where it will not negatively impact flood conditions and main channel flood conveyance. Further discussion is provided in Section 3.2.1.

3.2 POST-DEVELOPMENT CONDITIONS

The following model updates and proposed drainage improvements were integrated into the 2D HEC-RAS model to reflect post-development conditions including measures to provide flood conveyance and mitigate impacts. The proposed development is illustrated on the Grading Plan (Drawing SG-1) enclosed for reference.

- The Manning's roughness coefficient layer was updated to reflect the proposed development land uses including residential development (0.05), proposed drainage swales/ditches (0.035) and internal streets (0.020);
- The 2D HEC-RAS model terrain was updated to reflect the proposed site grading at 101 Edward Street East and 111 George Street (neighbouring development to the west), and 163 and 164 Edward Street East;
- The proposed grading for 163 and 164 Edward Street East includes a north perimeter swale to intercept external overland drainage and a perimeter ditch along the west and south property lines south of Edward Street East to provide conveyance of flood flows around the site. The south perimeter ditch is proposed to extend to Airport Road to provide an outlet for the proposed south SWMF;
- The model geometry was updated to include a proposed 2.4 x 1.2 m concrete box culvert along the Edward Street East right-of-way in place of the ditch proposed by the East Creemore Drainage Study;

- Proposed twin 750 mm diameter CSP culverts were included at the flow splitter to convey flow to the proposed south wraparound ditch;
- Proposed twin 1050 mm diameter CSP culverts were included under the proposed extension of George Street into 163 Edward Street East; and
- Proposed twin 900 mm diameter CSP culverts were included within a proposed berm in the south perimeter ditch to maintain the existing flood patterns of the Mad River spill.

The post-development flooding conditions for the Edward Street Tributary and the Mad River Spill are summarized below. The Post-Development Conditions Flood Hazard Plan (Drawing FH.2) enclosed for reference should be referenced when reviewing this section.

- The Edward Street Tributary flow from the Tribute Channel (POI A) will be directed to a flow splitter at 163 Edward Street East, with a portion conveyed south through the 1,200 mm diameter storm sewer (POI C). The 1,200 mm storm sewer conveys flow along Concession 3 where it eventually discharges to the Mad River (POI L);
- A portion of the Edward Street Tributary flow will continue eastwards through a proposed 2.4 x 1.2 m concrete box culvert along the Edward Street East ROW and via overland flow along the Edward Street East ROW (POI B). This flow will continue to the Edward Street East culvert crossing (POI D) and along the ECDS channel to Airport Road (POI E);
- The remaining flow at the flow splitter will be directed south via proposed twin 750 mm diameter CSP culverts crossing Edward Street East to the proposed perimeter ditch along the western and southern limit of 163 Edward Street East, extending to Airport Road. A berm across the ditch along the south property line with proposed twin 900 mm diameter CSP culverts will direct some flow to Airport Road, with the remainder spilling south (POI G) to mimic existing conditions; and
- The Mad River Spill flow from the west will be conveyed by the proposed drainage measures with most of the flow being conveyed by the perimeter channel around 163 Edward Street East to mimic existing conditions. A smaller portion of the spill flow will be conveyed by the Edward Street East box culvert to the ECDS channel also generally matching existing flood patterns.

A summary of post-development peak flows at POIs is provided in Table 3.

Table 3: Post-Development Peak Flow Summary

POINT OF INTEREST (POI)	POST-DEVELOPMENT PEAK FLOW (m^3/s)	
	EDWARD STREET TRIBUTARY	MAD RIVER SPILL
(A) Tribute Channel	10.10 (*10.10*)	0.00 (*0.00*)
(B) Edward Street East ROW & Prop. 2.4 x 1.2 m Conc. Box Culvert at 163/164 Edward Street East	4.81 (*7.33*)	4.36 (*3.95*)
(C) 1,200 mm Ø STM Per ECDS 30% Design	2.77 (*2.77*)	2.26 (*0.56*)
(D) ECDS Channel at Edward Street East Culvert Crossing	5.34 (*5.21*)	4.12 (*3.71*)
(E) ECDS Channel at Airport Road	6.00 (*6.96*)	5.26 (*5.62*)
(F) 163 Edward Street East West Property Line	0.00 (*0.07*)	0.00 (*8.53*)
(G) 163 Edward Street East South Flow Path	0.06 (*0.04*)	3.33 (*5.35*)
(H) South Portion of 2108 County Road 42	0.05 (*0.24*)	14.59 (*16.62*)
(I) South Portion of 3141 Concession Road 3	0.00 (*0.21*)	24.64 (*24.43*)
(J) Flow Along West Side of Airport Road	4.46 (*4.50*)	3.99 (*3.53*)
(K) Flow Across Sideroad 6/7 Between Airport Road and Concession Road 3	0.00 (*0.00*)	14.58 (*14.25*)
(L) ECDS Mad River Outlet	2.53 (*2.47*)	12.34 (*10.91*)
(M) Flow Across Sideroad 6/7 at Airport Road	5.00 (4.33)	19.40 (*21.05*)
(N) Edward Street East ROW West of 101 Edward Street East	0.00 (*0.00*)	11.75 (*11.75*)
(O) Edward Street East ROW at 101 Edward Street East	0.00 (*0.00*)	6.07 (*2.40*)

Note: The values in italics represent pre-development peak flows.

Based on the hydraulic analysis summarized herein, the proposed development will generally maintain the existing flooding patterns for the surrounding area. None of the changes to flood conditions are predicted to negatively impact existing infrastructure or flood risk for properties surrounding the site. A comparison between pre- and post-development flood extents is

illustrated on the Pre-Development vs. Post Development Conditions Flood Hazard Plan (Drawing FH.3) enclosed for reference.

3.2.1 Post-Development Floodway Criteria

Maximum post-development depth, velocity, and depth-velocity product from the HEC-RAS model were compared to the floodway criteria for the Mad River Hazard Lands Specific Policy Area 13.2.1, as shown on Figures 4 to 6 in Appendix D. These figures show that post-development conditions are generally similar to pre-development conditions, with some improvement at select properties along George Street. Based on this review, the proposed development does not negatively impact the floodway delineation from pre-development conditions.

3.2.2 50% Obstruction Sensitivity Analysis and Safe Access/Egress

A 50% blocked sensitivity analysis was completed for the proposed 2.4 x 1.2 m concrete box culvert along Edward Street East to analyze the impact on flooding and safe access and egress criteria. The hydraulic analysis confirmed that under both the unblocked and 50% blocked scenarios, safe access and egress is achieved on both Edward Street East and George Street. Maximum post-development depth, velocity, depth-velocity product from the HEC-RAS model were compared to the floodway criteria for the Mad River Hazard Lands Specific Policy Area 13.2.1 and safe access/egress criteria, as shown on Figures 7 to 9 in Appendix D.

4 Cumulative Impacts Assessment

A cumulative impact assessment was completed to evaluate the combined effects of potential development on nearby properties within the settlement area. The pre-development conditions floodplain and the Creemore Land Use Plan (Schedule B-4 in the Official Plan) were reviewed to identify properties which have a similar opportunity for development as the subject site. The following properties were identified:

- 3141 Concession 3 South Nottawasaga (northeast portion);
- 3108 County Road 42;
- 67 George Street (front portion);
- 47 George Street; and
- 90, 102, and 104, Edward Street East.

Other minor infill development opportunities are present further west within Creemore, however, based on our review of the pre-development floodplain conditions, development of these properties is not anticipated to functionally impact flooding patterns extending down to the subject site.

The identified properties were modeled in the 2D HEC-RAS hydraulic model in a similar manner of development to that proposed at 163/164 Edward Street East which includes raised grading for floodproofing and perimeter drainage conveyance to direct flows around these properties to appropriate outlet locations to maintain existing flooding patterns. Significant portions of 3141 Concession 3 South Nottawasaga and 67 George Street are identified as “Greenland – Hazard Lands Area”. These properties were modelled to generally respect the delineated hazard areas with some potential encroachment into the “Greenland – Hazard Lands Area” based on flooding conditions on the properties. It is noted that potential future applications may identify alternative development extents, however, we anticipate the approach to development while mitigating flood conditions would be similar. Peak flows for the Cumulative Impacts Assessment at Points of Interest (POI) are summarized in Table 4 below.

Table 4: Cumulative Impact Peak Flow Summary

POINT OF INTEREST (POI)	POST-DEVELOPMENT PEAK FLOW (m^3/s)	
	EAST CREEMORE DRAIN	MAD RIVER SPILL
(A) Tribute Channel	10.10 (*10.10*)	0.00 (*0.00*)
(B) Edward Street East ROW & Prop. 2.4 x 1.2 m Conc. Box Culvert at 163/164 Edward Street East	4.82 (*7.33*)	3.36 (*3.95*)
(C) 1,200 mm Ø STM Per ECDS 30% Design	2.77 (*2.77*)	2.26 (*0.56*)
(D) ECDS Channel at Edward Street East Culvert Crossing	5.34 (*5.21*)	2.69 (*3.71*)
(E) ECDS Channel at Airport Road	5.53 (*6.96*)	4.09 (*5.62*)
(F) 163 Edward Street East West Property Line	0.00 (*0.07*)	0.00 (*8.53*)
(G) 163 Edward Street East South Flow Path	0.00 (*0.04*)	0.00 (*5.35*)
(H) South Portion of 2108 County Road 42	0.12 (*0.24*)	16.46 (*16.62*)
(I) South Portion of 3141 Concession Road 3	0.00 (*0.21*)	24.27 (*24.43*)
(J) Flow Along West Side of Airport Road	4.91 (*4.50*)	5.28 (*3.53*)
(K) Flow Across Sideroad 6/7 Between Airport Road and Concession Road 3	0.00 (*0.00*)	12.84 (*14.25*)
(L) ECDS Mad River Outlet	2.53 (*2.47*)	12.22 (*10.91*)
(M) Flow Across Sideroad 6/7 at Airport Road	5.00 (4.33)	21.83 (*21.05*)
(N) Edward Street East ROW West of 101 Edward Street East	0.00 (*0.00*)	11.75 (*11.75*)
(O) Edward Street East ROW at 101 Edward Street East	0.00 (*0.00*)	6.37 (*2.40*)

Note: The values in italics represent pre-development peak flows.

Based on the cumulative impact assessment summarized herein, the potential developments listed above are expected to generally maintain existing flood conveyance patterns in the surrounding area. The results indicate that these developments are not anticipated to increase flood risk to adjacent properties or adversely affect existing infrastructure and represents an

acceptable encroachment into the floodplain under the two-zone concept. However, site-specific studies will be required to confirm final grading and verify the associated flood impacts at each property. The cumulative impact flood extents are illustrated on the Cumulative Impact Flood Hazard Plan (Drawing FH-4) enclosed for reference.

5 Summary

A flood hazard assessment was completed to support the proposed development at 163 & 164 Edward Street East, including review of floodproofing requirements and potential effects on surrounding flood conditions. The proposed development is expected to result in minor changes to flood conveyance, however, will generally maintain the existing flood conditions for the surrounding area. The predicted changes are not anticipated to adversely impact flood depth, velocity, or depth–velocity product criteria, nor increase flood risk for surrounding properties. A sensitivity analysis confirmed that safe access and egress is achieved on both Edward Street East and George Street under unblocked and 50% blocked scenarios for the proposed 2.4 x 1.2 m box culvert along Edward Street East. A cumulative impact assessment was also completed to evaluate the combined effects of potential development on nearby properties with a similar opportunity for development. Preliminary results indicate these properties may be developed in a manner that generally mimics the proposed development of 163 and 164 Edward Street East, however, site-specific studies are required to confirm potential impacts. Based on the results of this assessment, it is our conclusion that the proposed development at 163 and 164 Edward Street East may proceed as it has been demonstrated the development can proceed in a manner which will not negatively impact flood conditions nor increase flood risk for adjacent properties, and the proposed development can be protected from flooding.

NOTE: EAST CREEMORE DRAIN CHANNEL AND STORM SERVICING DESIGN BASED ON RJ BURNSIDE'S REISSUED FOR 30% REVIEW DRAWINGS (DATED AUG 08/25).

COUNTY ROAD 9

TRIBUTE LANDS DRAINAGE CHANNEL ℄ BASED ON CROZIER'S FSSWMR FOR TRIBUTE (CREEMORE) LIMITED (DATED APRIL 2023)

EDWARD STREET TRIBUTARY

KEY LOCATION 'D'
QREGIONAL ECD: 5.21m³/s
QREGIONAL SPILL: 3.71m³/s

2 - 900Ø CSP CULVERTS

1500Ø CSP CULVERT

2 - 900Ø CSP CULVERTS

KEY LOCATION 'A'
QREGIONAL ECD: 10.10m³/s
QREGIONAL SPILL: 0.00m³/s

CHANNEL PER ECD 30% DESIGN

KEY LOCATION 'B'
QREGIONAL ECD: 7.33m³/s
QREGIONAL SPILL: 3.95m³/s

EDWARD STREET EAST

CHANNEL PER ECD 30% DESIGN

KEY LOCATION 'E'
QREGIONAL ECD: 6.96m³/s
QREGIONAL SPILL: 5.62m³/s

MARY STREET

KEY LOCATION 'O'
QREGIONAL ECD: 0.00m³/s
QREGIONAL SPILL: 2.40m³/s

FLOW SPLITTER

1500Ø CSP CULVERT

EX. 1600Ø STM CROSSING AIRPORT ROAD TO MAD RIVER TRIBUTARY

KEY LOCATION 'N'
QREGIONAL ECD: 0.00m³/s
QREGIONAL SPILL: 11.75m³/s

1200Ø STM @ 0.2%

1200Ø STM PER ECD 30% DESIGN
KEY LOCATION 'C'
QREGIONAL ECD: 2.77m³/s
QREGIONAL SPILL: 0.56m³/s

*OUTLET #1

KEY LOCATION 'F'
QREGIONAL ECD: 0.07m³/s
QREGIONAL SPILL: 8.53m³/s

GEORGE STREET

EDWARD STREET TRIBUTARY

KEY LOCATION 'J'
QREGIONAL ECD: 4.50m³/s
QREGIONAL SPILL: 3.53m³/s

AIRPORT ROAD

KEY LOCATION 'G'
QREGIONAL ECD: 0.04m³/s
QREGIONAL SPILL: 5.35m³/s

KEY LOCATION 'H'
QREGIONAL ECD: 0.24m³/s
QREGIONAL SPILL: 16.62m³/s

1200Ø STM PER ECD 30% DESIGN

CONCESSION ROAD 3

KEY LOCATION 'I'
QREGIONAL ECD: 0.21m³/s
QREGIONAL SPILL: 24.43m³/s

*OUTLET #2

MAD RIVER TRIBUTARY

EX. CULVERT

KEY LOCATION 'M'
QREGIONAL ECD: 4.33m³/s
QREGIONAL SPILL: 21.05m³/s

MAD RIVER

SIDEROAD 6-7

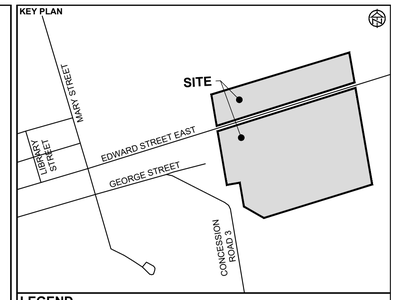
KEY LOCATION 'K'
QREGIONAL ECD: 0.00m³/s
QREGIONAL SPILL: 14.25m³/s

1350Ø STM PER ECD 30% DESIGN

CHANNEL PER ECD 30% DESIGN

KEY LOCATION 'L'
QREGIONAL ECD: 2.47m³/s
QREGIONAL SPILL: 10.91m³/s

KEY PLAN



LEGEND

- SUBJECT SITE
- 280.00 — EXISTING ELEVATION LiDAR CONTOUR (5m INTERVALS)
- PRE-DEVELOPMENT REGIONAL (TIMMINS) FLOOD EXTENTS
- WATERCOURSE (APPROXIMATE LOCATION)
- TRIBUTE LANDS DRAINAGE CHANNEL CENTRELINE
- EAST CREEMORE DRAIN CHANNEL
- EAST CREEMORE DRAIN STORM SEWER
- EAST CREEMORE DRAIN CULVERT
- EXISTING CULVERT
- FLOOD FLOW DIRECTION
- KEY LOCATION QREGIONAL ECD QREGIONAL SPILL — KEY LOCATION PEAK FLOW RATE

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VERSION		DATE
1	ISSUED FOR OPA/ZBA 1ST SUBMISSION	2026 07 XX

DESIGN BY	DRAWN BY	CHECKED BY
GT	LQ	JM

STAMP

TATHAM ENGINEERING

COLLINGWOOD - BRACEBRIDGE - ORILLIA - BARRIE - OTTAWA - GUELPH

PROJECT TITLE

163 & 164 EDWARD STREET EAST, CREEMORE TOWNSHIP OF CLEARVIEW

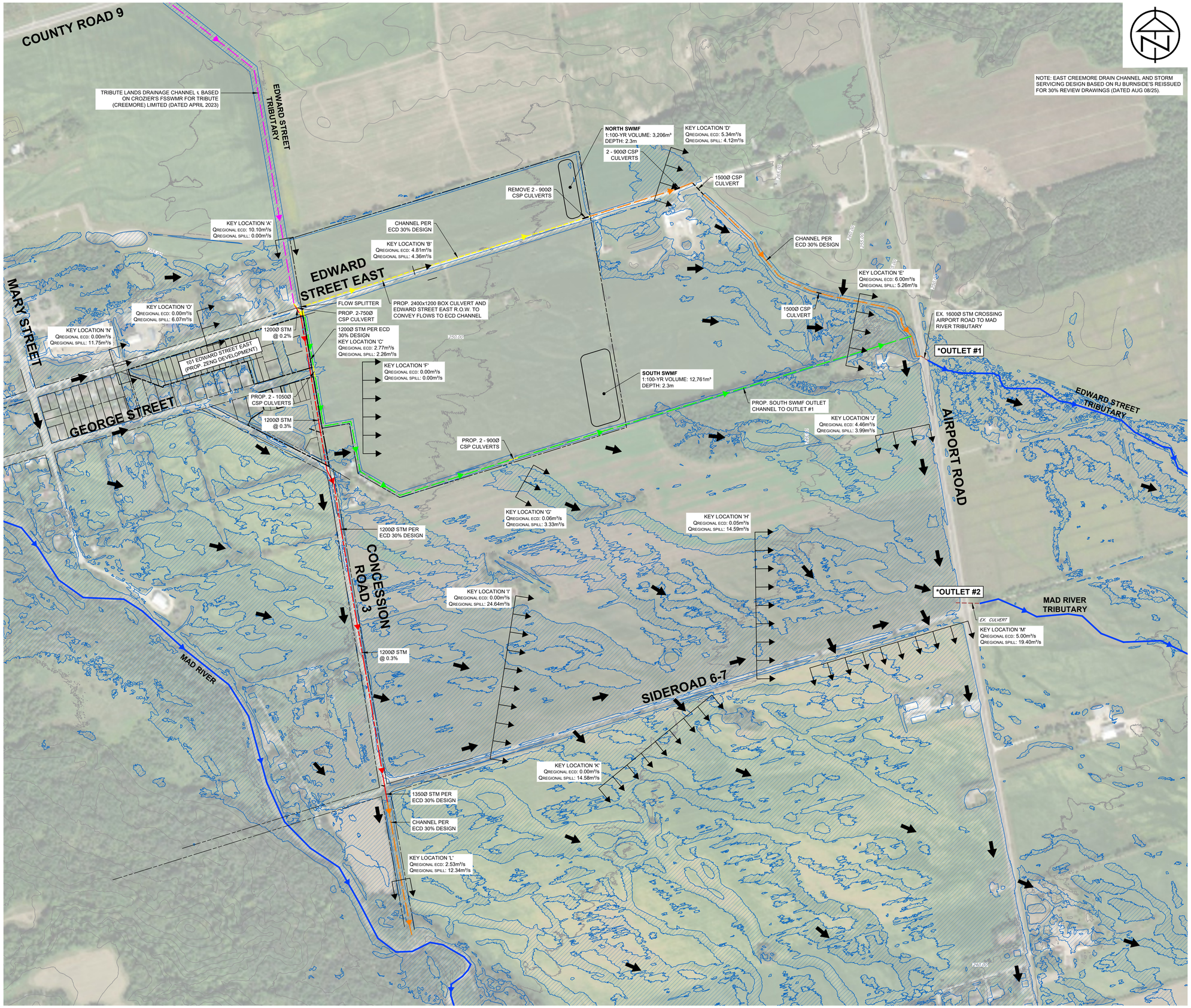
DRAWING TITLE

FLOOD HAZARD PLAN PRE-DEVELOPMENT CONDITIONS

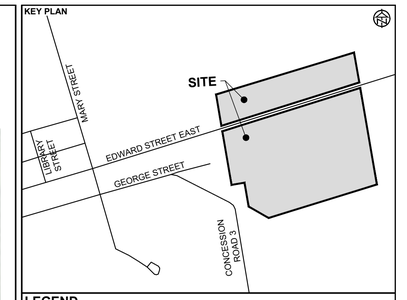
PROJECT	SCALE	DRAWING
419453	1:4000	FH.1

0 8 16 32 METRES

Drawing Path: O:\Barrie\2019 PROJECTS\419453 - 163 & 164 Edward St\E. Crowmore\CDD\OPA Support - Design\Sheets\Flood Hazard\419453-FH01.dwg, Plotted: Jul 13, 2026



KEY PLAN



LEGEND

- SUBJECT SITE
- 280.00 EXISTING ELEVATION LiDAR CONTOUR (5m INTERVALS)
- POST-DEVELOPMENT REGIONAL (TIMMINS) FLOOD EXTENTS
- WATERCOURSE (APPROXIMATE LOCATION)
- TRIBUTE LANDS DRAINAGE CHANNEL CENTRELINE
- EAST CREEMORE DRAIN DITCH/CHANNEL
- EAST CREEMORE DRAIN STORM SEWER
- EAST CREEMORE DRAIN CULVERT
- PROPOSED CULVERT
- EXISTING CULVERT
- PROPOSED DEVELOPMENT DITCH/CHANNEL
- FLOOD FLOW DIRECTION
- KEY LOCATION / QREGIONAL ECD / QREGIONAL SPILL — KEY LOCATION PEAK FLOW RATE

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TATHAM ENGINEERING

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PROJECT TITLE

163 & 164 EDWARD STREET EAST, CREEMORE TOWNSHIP OF CLEARVIEW

DRAWING TITLE

FLOOD HAZARD PLAN POST-DEVELOPMENT CONDITIONS

PROJECT	SCALE	DRAWING
419453	1:4000	FH.2

0 8 16 32 METRES

Drawing Path: O:\Barrie\2019 PROJECTS\419453 - 163 & 164 Edward St E - Crowmere\CAD\OPA Support - Design\Sheets\Flood Hazard\419453-FH02.dwg Plotted: Jul 13, 2026

COUNTY ROAD 9

TRIBUTE LANDS DRAINAGE CHANNEL ℄ BASED ON CROZIER'S FSSWMR FOR TRIBUTE (CREEMORE) LIMITED (DATED APRIL 2023)

EDWARD STREET TRIBUTARY

NOTE: EAST CREEMORE DRAIN CHANNEL AND STORM SERVICING DESIGN BASED ON RJ BURNSIDE'S REISSUED FOR 30% REVIEW DRAWINGS (DATED AUG 08/25).

NORTH SWMF
1:100-YR VOLUME: 3,206m³
DEPTH: 2.3m

2 - 900Ø CSP CULVERTS

KEY LOCATION 'D'
QPRE-DEV REGIONAL ECD: 5.21m³/s
QPRE-DEV REGIONAL SPILL: 3.71m³/s
QPOST-DEV REGIONAL ECD: 5.34m³/s
QPOST-DEV REGIONAL SPILL: 4.12m³/s

1500Ø CSP CULVERT

REMOVE 2 - 900Ø CSP CULVERTS

CHANNEL PER ECD 30% DESIGN

KEY LOCATION 'A'
QPRE-DEV REGIONAL ECD: 10.10m³/s
QPRE-DEV REGIONAL SPILL: 0.00m³/s
QPOST-DEV REGIONAL ECD: 10.10m³/s
QPOST-DEV REGIONAL SPILL: 0.00m³/s

KEY LOCATION 'B'
QPRE-DEV REGIONAL ECD: 7.33m³/s
QPRE-DEV REGIONAL SPILL: 3.95m³/s
QPOST-DEV REGIONAL ECD: 4.81m³/s
QPOST-DEV REGIONAL SPILL: 4.36m³/s

PROP. 2 - 750Ø CSP CULVERT

MARY STREET

EDWARD STREET EAST

PROP. 2400x1200 BOX CULVERT AND EDWARD STREET EAST R.O.W. TO CONVEY FLOWS TO ECD CHANNEL

FLOW SPLITTER

KEY LOCATION 'O'
QPRE-DEV REGIONAL ECD: 0.00m³/s
QPRE-DEV REGIONAL SPILL: 2.40m³/s
QPOST-DEV REGIONAL ECD: 0.00m³/s
QPOST-DEV REGIONAL SPILL: 6.07m³/s

1200Ø STM PER ECD 30% DESIGN
KEY LOCATION 'C'
QPRE-DEV REGIONAL ECD: 2.77m³/s
QPRE-DEV REGIONAL SPILL: 0.56m³/s
QPOST-DEV REGIONAL ECD: 2.77m³/s
QPOST-DEV REGIONAL SPILL: 2.26m³/s

KEY LOCATION 'N'
QPRE-DEV REGIONAL ECD: 0.00m³/s
QPRE-DEV REGIONAL SPILL: 11.75m³/s
QPOST-DEV REGIONAL ECD: 0.00m³/s
QPOST-DEV REGIONAL SPILL: 11.75m³/s

1200Ø STM @ 0.2%

KEY LOCATION 'F'
QPRE-DEV REGIONAL ECD: 0.07m³/s
QPRE-DEV REGIONAL SPILL: 8.53m³/s
QPOST-DEV REGIONAL ECD: 0.00m³/s
QPOST-DEV REGIONAL SPILL: 0.00m³/s

ZENG LANDS

PROP. 2 - 1050Ø CSP CULVERTS

1200Ø STM @ 0.3%

GEORGE STREET

SOUTH SWMF
1:100-YR VOLUME: 12,761m³
DEPTH: 2.3m

PROP. SOUTH SWMF OUTLET CHANNEL TO OUTLET #1

PROP. 2 - 900Ø CSP CULVERTS

KEY LOCATION 'G'
QPRE-DEV REGIONAL ECD: 0.04m³/s
QPRE-DEV REGIONAL SPILL: 5.35m³/s
QPOST-DEV REGIONAL ECD: 0.06m³/s
QPOST-DEV REGIONAL SPILL: 3.33m³/s

1200Ø STM PER ECD 30% DESIGN

CONCESSION ROAD 3

KEY LOCATION 'H'
QPRE-DEV REGIONAL ECD: 0.24m³/s
QPRE-DEV REGIONAL SPILL: 16.62m³/s
QPOST-DEV REGIONAL ECD: 0.05m³/s
QPOST-DEV REGIONAL SPILL: 14.59m³/s

KEY LOCATION 'I'
QPRE-DEV REGIONAL ECD: 0.21m³/s
QPRE-DEV REGIONAL SPILL: 24.43m³/s
QPOST-DEV REGIONAL ECD: 0.00m³/s
QPOST-DEV REGIONAL SPILL: 24.64m³/s

1200Ø STM @ 0.3%

MAD RIVER

SIDEROAD 6-7

KEY LOCATION 'K'
QPRE-DEV REGIONAL ECD: 0.00m³/s
QPRE-DEV REGIONAL SPILL: 14.25m³/s
QPOST-DEV REGIONAL ECD: 0.00m³/s
QPOST-DEV REGIONAL SPILL: 14.58m³/s

1350Ø STM PER ECD 30% DESIGN

CHANNEL PER ECD 30% DESIGN

KEY LOCATION 'L'
QPRE-DEV REGIONAL ECD: 2.47m³/s
QPRE-DEV REGIONAL SPILL: 10.91m³/s
QPOST-DEV REGIONAL ECD: 2.53m³/s
QPOST-DEV REGIONAL SPILL: 12.34m³/s

CHANNEL PER ECD 30% DESIGN

KEY LOCATION 'E'
QPRE-DEV REGIONAL ECD: 6.96m³/s
QPRE-DEV REGIONAL SPILL: 5.62m³/s
QPOST-DEV REGIONAL ECD: 6.00m³/s
QPOST-DEV REGIONAL SPILL: 5.26m³/s

1500Ø CSP CULVERT

EX. 1600Ø STM CROSSING AIRPORT ROAD TO MAD RIVER TRIBUTARY

*OUTLET #1

EDWARD STREET TRIBUTARY

KEY LOCATION 'J'
QPRE-DEV REGIONAL ECD: 4.50m³/s
QPRE-DEV REGIONAL SPILL: 3.53m³/s
QPOST-DEV REGIONAL ECD: 4.46m³/s
QPOST-DEV REGIONAL SPILL: 3.99m³/s

AIRPORT ROAD

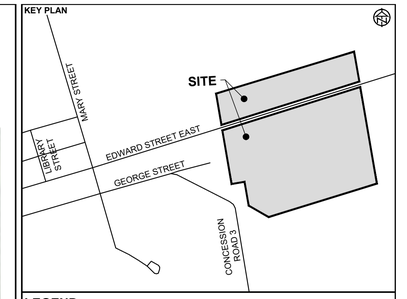
*OUTLET #2

EX. CULVERT

MAD RIVER TRIBUTARY

KEY LOCATION 'M'
QPRE-DEV REGIONAL ECD: 4.33m³/s
QPRE-DEV REGIONAL SPILL: 21.05m³/s
QPOST-DEV REGIONAL ECD: 5.00m³/s
QPOST-DEV REGIONAL SPILL: 19.40m³/s

KEY PLAN



LEGEND

- SUBJECT SITE
- EXISTING ELEVATION LiDAR CONTOUR (5m INTERVALS)
- PRE-DEVELOPMENT REGIONAL (TIMMINS) FLOOD EXTENTS
- POST-DEVELOPMENT REGIONAL (TIMMINS) FLOOD EXTENTS
- MAD RIVER WATERCOURSE (APPROXIMATE LOCATION)
- TRIBUTE LANDS DRAINAGE CHANNEL CENTRELINE
- EAST CREEMORE DRAIN DITCH/CHANNEL
- EAST CREEMORE DRAIN STORM SEWER
- EAST CREEMORE DRAIN CULVERT
- PROPOSED CULVERT
- EXISTING CULVERT
- PROPOSED DEVELOPMENT DITCH/CHANNEL
- POST-DEVELOPMENT FLOOD FLOW DIRECTION
- KEY LOCATION PEAK FLOW RATE

KEY LOCATION
QREGIONAL ECD
QREGIONAL SPILL

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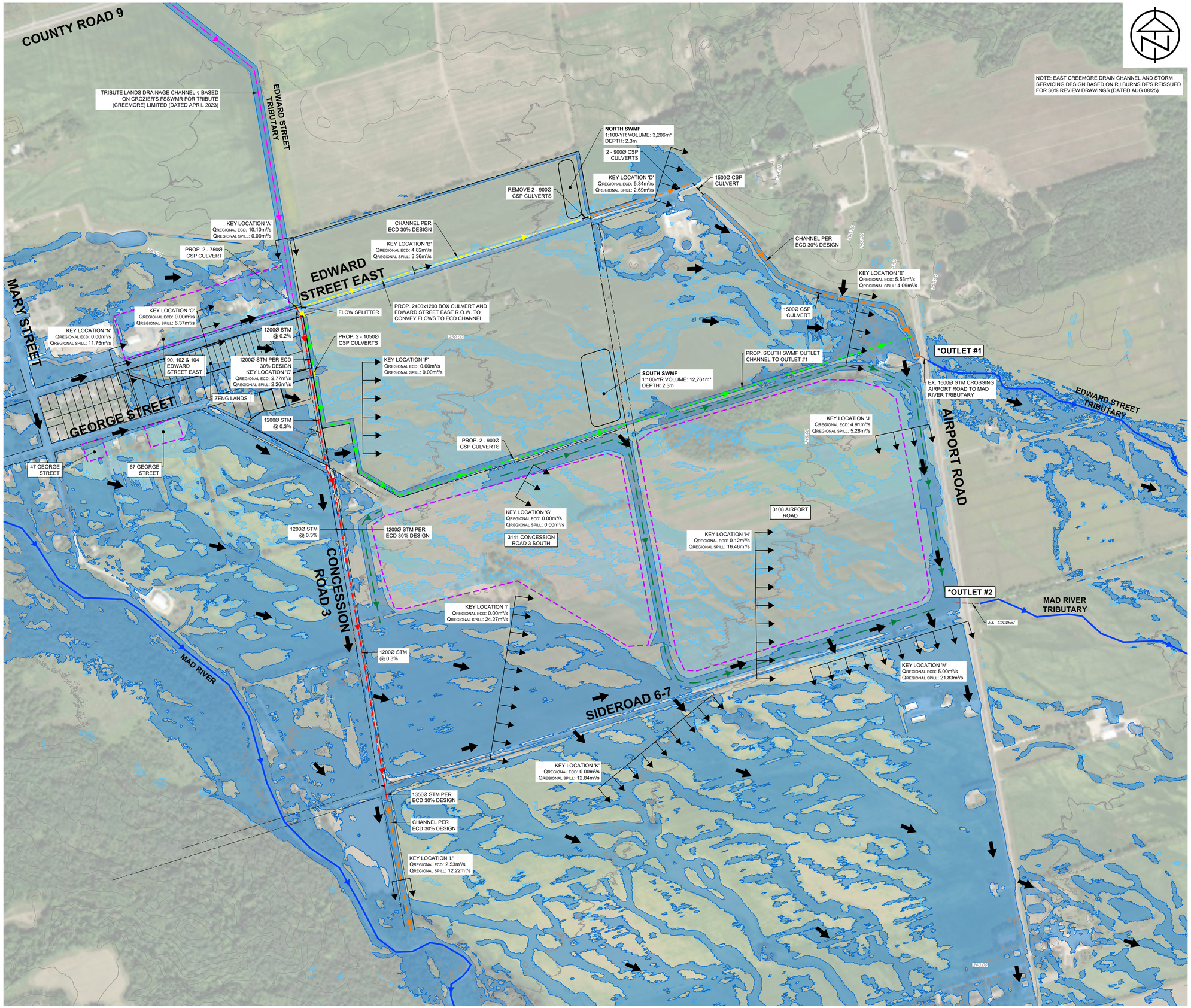
PROJECT TITLE
163 & 164 EDWARD STREET EAST, CREEMORE TOWNSHIP OF CLEARVIEW

DRAWING TITLE
FLOOD HAZARD PLAN PRE-DEVELOPMENT VS. POST-DEVELOPMENT CONDITIONS

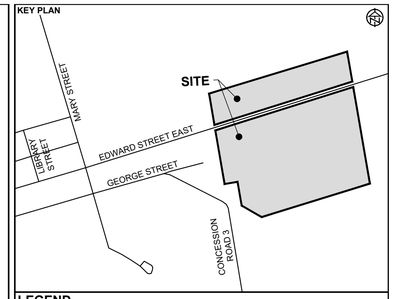
PROJECT	SCALE	DRAWING
419453	1:4000	FH.3

0 8 16 32 METRES

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KEY PLAN



LEGEND

- SUBJECT SITE
- 250.00 EXISTING ELEVATION LiDAR CONTOUR (5m INTERVALS)
- CUMULATIVE IMPACT REGIONAL (TIMMINS) FLOOD EXTENTS
- PRE-DEVELOPMENT REGIONAL (TIMMINS) FLOOD EXTENTS
- MAD RIVER WATERCOURSE (APPROXIMATE LOCATION)
- TRIBUTE LANDS DRAINAGE CHANNEL CENTRELINE
- EAST CREEMORE DRAIN DITCH/CHANNEL
- EAST CREEMORE DRAIN STORM SEWER
- EAST CREEMORE DRAIN CULVERT
- PROPOSED CULVERT
- EXISTING CULVERT
- PROPOSED DEVELOPMENT DITCH/CHANNEL
- CONCEPTUAL PARCEL RAISED GRADING
- CONCEPTUAL PARCEL PERIMETER DITCH
- FLOOD FLOW DIRECTION
- KEY LOCATION PEAK FLOW RATE
  QREGIONAL ECD
  QREGIONAL SPILL

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PROJECT TITLE

163 & 164 EDWARD STREET EAST, CREEMORE TOWNSHIP OF CLEARVIEW

DRAWING TITLE

FLOOD HAZARD PLAN CUMULATIVE IMPACT ASSESSMENT

PROJECT	SCALE	DRAWING
419453	1:4000	FH.4

0 8 16 32 METRES

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Appendix A: Background

TATHAM ENGINEERING

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Barrie, Ontario L4N 9H8

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E info@tathameng.com
tathameng.com

File 419453

April 28, 2026

Davin Metheral, BURPI
Planner
Nottawasaga Valley Conservation Authority
8195 8th Line
Utopia, Ontario L0M 1T0
dmetheral@nvca.on.ca

Re: 163 & 164 Edward Street, Creemore, Township of Clearview
Flood Hazard Assessment Terms of Reference (Final)

Dear Davin:

Further to our meeting on September 11, 2025, and the NVCA's comments dated January 15, 2026, and April 9, 2026, we have prepared this letter to outline terms of reference for the Flood Hazard Assessment in support of the proposed development of 163 & 164 Edward Street in Creemore.

BACKGROUND

The subject site located at 163 and 164 Edward Street E is subject to potential flood and drainage conveyance issues associated with the Edward Street Tributary of the Mad River which, under existing conditions, bisects 163 Edward Street and flows through the northeast corner of 164 Edward Street E. The Edward Street Tributary has been assessed through the *East Creemore Drainage Study* Municipal Class EA prepared by R. J. Burnside, and improvements to this tributary have been identified to support development in East Creemore. The subject site is also potentially subject to a flood hazard associated with the Mad River which would enter the site from the west as identified in the *Upper Mad River Flood Hazard Mapping Hydraulic Modelling Report* prepared by Aquafor Beech. As such, the NVCA has requested a flood hazard study be completed for the subject site which considers both the Edward Street Tributary and the works proposed by the *East Creemore Drainage Study,* and the flooding identified by the *Upper Mad River Flood Hazard Mapping Hydraulic Modelling Report.*

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TERMS OF REFERENCE

1. Model Methodology

Hydrology

We propose to use the hydrology developed for the *Upper Mad River Flood Hazard Mapping Hydraulic Modelling Report* for this assessment. We propose to use the hydrology from this study as the hydrologic model was calibrated against observed streamflow data and this study has been accepted by the NVCA. To support our use of the hydrology from the *Upper Mad River Flood Hazard Mapping Hydraulic Modelling Report*, we request the NVCA provide us with the HEC-HMS hydrologic model developed for the study. This will allow us to review the hydrology in more detail and identify potential discretization of the flows used in the hydraulic model to increase model accuracy. For the Edward Street Tributary, we will compare the flows from the Mad River study to those from the East Creemore Drainage study and resolve with the NVCA the appropriate flows to use for this analysis.

As per the *Upper Mad River Flood Hazard Mapping Hydraulic Modelling Report*, the Timmins Storm is identified as the Regulatory Storm for these drainage systems, and as such our analysis will only include the Timmins Storm scenario.

Hydraulics

We propose to use the hydraulic model developed for the *Upper Mad River Flood Hazard Mapping Hydraulic Modelling Report* as a basis for this assessment. Given the complexity of the flooding conditions associated with the Mad River and the proposed flow splitting associated with the East Creemore Drainage Study works, a 2D hydraulic model is appropriate for this exercise.

The hydraulic modelling will be completed concurrently for the Edward Street Tributary and the Mad River using the hydrographs from the selected hydrologic model. There is a significant difference in timing between these two drainage systems, however, the hydraulic modelling approach will account for any residual flows or flood storage in the Edward Street Tributary drainage system when the flooding from the Mad River enters the system. Continuous flood hazard extents will be delineated based on the overall maximum extent of flooding identified in the model.

2. Baseline Conditions – Pre-Development

The first iteration of the Flood Hazard Assessment will identify flood hazard extents for pre-development conditions only. Pre-development conditions are defined as existing conditions with completion of the East Creemore Drainage Study (ECDS) works, and the drainage works associated with the Tribute development which is located upstream and to the west of the subject site. The following drainage improvements will be included in the baseline conditions, as it is expected this work will be completed prior to development of the subject site:



- **Tribute development:** Proposed drainage channel from County Road 9 to Edward Street E along the eastern extent of the development (design information to be confirmed with proponent) This channel is planned to contain the floodplain per the Functional Servicing and SWM Implementation Report prepared by Crozier.
- **ECDS works:** Proposed 1200 mm diameter storm sewer along Concession 3 from Edward Street E to Nottawasaga 6/7 Sideroad and proposed ditch above. Proposed outlet ditch from Nottawasaga 6/7 Sideroad to Mad River (Per R. J. Burnside design).
- **ECDS works:** Proposed ditch along Edward Street E from Concession 3 to 187 Edward Street E, 1500 mm diameter culvert crossing Edward Street E, and ditch through 187 and 237 Edward Street E to Airport Road (Per R. J. Burnside design).
- **101 Edward Street Development:** Raised site grading and urbanization of the south half of Edward Street E. Scenarios with and without this development will be considered as the timing of the development is unknown.

Additionally, we propose to include refinements to the NVCA's 2D hydraulic model to improve the model accuracy with respect to the spill at the Mad River. These refinements include:

- Updates to the channel/bridge geometry at and upstream of Caroline Street to reflect the measured bridge opening areas where LiDAR data appears erroneous;
- Refinements to the cell mesh along the east bank of the Mad River to allow the model to more accurately reflect the terrain in this area;
- Corrections to the Manning's roughness coefficient layer to reflect more detailed land use information;

Details regarding model refinements will be discussed and justification provided in the Flood Hazard Assessment Report.

3. Pre-Development Flood Hazard Assessment

Using the model methodology and pre-development conditions described in the previous sections we will delineate the pre-development conditions flood hazard limit across the subject property and downstream to the Mad River and Airport Road. The delineation will be completed based on the maximum flooding extents determined from the updated hydraulic model.

The assessment will identify any flooding impacting the subject site following implementation of the *East Creemore Drainage Study* improvements and the improvements associated with the Tribute development. We will also identify capacity "deficiencies" in the proposed drainage works which lead to such flooding and will inform the proposed solutions to address flood hazards impacting the subject site.

4. Terms of Reference for Proposed Condition Flood Hazard Assessment

Based on the initial feedback received from the NVCA and the pre-development flood hazard model completed to date, we have prepared the following terms of reference for the Proposed Condition Flood Hazard Assessment.

The results of the Pre-Development Flood Hazard Assessment confirm the proposed ECDS works will improve flooding conditions for the subject site. The ECDS works have significant benefits for the north portion of the subject site which is primarily impacted by flooding associated with the Edward Street Tributary under existing conditions. The ECDS works essentially eliminate flooding for the north portion of the subject site. The ECDS works are less effective at mitigating flooding from the Mad River which impacts the south portion of the subject property. However, the works result in a net improvement from existing conditions and the Mad River flood peak flow through the subject site is reduced to approximately 4.5 m^3/s which we believe can feasibly be conveyed through proposed drainage channels and/or overland flow routes.

The assessment will delineate the floodway and flood fringe extents across the subject site in accordance with the criteria defined in the Official Plan of The Township of Clearview. That said, we recognize the criteria listed in the Official Plan (exceedance of 0.3 m depth, 1.7 m/s velocity, 0.4 m^2/s d*v) may not be an appropriate indicator of floodway and flood fringe in this instance. In this regard we will assess and identify an approach where the proposed floodplain "encroachment" is demonstrated to be feasible without negatively impacting flood conditions elsewhere in the floodplain. As such, our proposed conditions assessment will focus on demonstrating a drainage solution which respects pre-development flood patterns, mitigates impacts to external properties, and protects the proposed development from flooding. We will provide additional justification in our reporting which supports this with reference to the definitions in the MNR *Technical Guide Floding Hazard Limit*.

The Proposed Condition Flood Hazard Assessment will identify the preferred solution for conveying flood flow from both the Edward Street Tributary and the Mad River. In addition to the ECDS works, the Tribute Development channel, and the 101 Edward Street development, the proposed conditions will include the preferred drainage solution and the preliminary grading design for the subject site. It is noted the preferred drainage solution may include alteration or adjustments to the design of the ECDS works, however, the intent of the design (conveying the 1:100-year flow from the Edward Street Tributary) will be maintained.

The Proposed Condition Flood Hazard Assessment will build upon the 2D hydraulic model used for the Pre-Development Assessment and will confirm the following:

- The proposed design maintains the intent of the ECDS works by providing conveyance of the 1:100-year peak flow from the Edward Street Tributary within the proposed drainage channels, culverts, sewers etc.;

- The developable portion of the subject site will be safely floodproofed from the flood hazards associated with both the Edward Street Tributary and the Mad River and safe access will be provided in accordance with NVCA criteria;
- The proposed design will mitigate or minimize to acceptable levels, the impacts to flooding on adjacent and downstream properties resulting from the development of the subject site;
- A sensitivity analysis will be completed with culverts and storm sewer inlets 50% obstructed to confirm sufficient floodproofing is provided; and
- A cumulative impact assessment will be completed which models the cumulative impacts to flooding resulting from the development of surrounding properties identified for development based on Schedule B-4 of The Official Plan of the Township of Clearview. Additional details on the proposed scope for the cumulative impact assessment are provided in the following section.

Cumulative Impact Assessment

The Official Plan of The Township of Clearview states under section 13.2.8:

In order to be considered a complete application, any application proposing development on the subject lands (Lands within Specific Policy Area 13.2.1) *shall be required to provide, to the satisfaction of the Township and the NVCA, a Cumulative Impacts Assessment that addresses the combined impacts of development in the flood fringe, which among other things should:*

a) identify any other properties in the surrounding area or in areas designated by the NVCA as being of interest that might have a similar opportunity for development; and
b) model the cumulative impacts of development in the flood fringe on the properties so identified to confirm that there will be no negative flooding impacts on surrounding properties.

We have reviewed the pre-development conditions floodplain and the Creemore Land Use Plan included as Schedule B-4 in the Official Plan, and we have identified the following properties which have a similar opportunity for development as the subject site:

- 3141 Concession 3 South Nottawasaga (northeast portion);
- 3108 County Road 42;
- 67 George Street (front portion);
- 47 George Street;
- 90, 102, and 104, Edward Street E;

Other minor infill development opportunities are present further west within Creemore, however, based on our review of the pre-development floodplain conditions, development of these properties is not



anticipated to functionally impact flooding patterns extending down to the subject site and we do not believe it necessary to analyze these properties in support of the development of the subject site.

For the cumulative impacts assessment, we will model the identified properties considering a similar manner of development as proposed at 163/164 Edward Street E which will generally include raised grading for floodproofing and perimeter drainage conveyance to direct flows around these properties to appropriate outlet locations which maintain the existing flooding patterns. Significant portions of 3141 Concession 3 South Nottawasaga and 67 George Street are identified as "Greenland – Hazard Lands Area". Our suggested approach for the cumulative impacts assessment will be to generally respect the delineated hazard areas with some potential minor encroachment into the "Greenland – Hazard Lands Area" as suitable based on flooding conditions on the properties. The model results under this scenario will be reviewed to determine the cumulative impacts of development and demonstrate there will be no negative flooding impacts on surrounding properties. The cumulative impacts assessment shall not define developable areas for the additional properties considered for development under the assessment.

We will prepare a Flood Hazard Assessment Report which summarizes the analysis completed for the Pre-Development and Proposed Conditions Scenarios, the impacts to flooding under proposed conditions and the required drainage improvements to support the proposed development, and the cumulative impacts assessment.

5. NVCA Review and Discussion

In the interest of advancing this project in a timely manner and limiting potential delays to other development projects which are dependent upon the ECDS works and potentially the recommendations of this study, we propose to complete the Proposed Condition Flood Hazard Assessment and Report prior to making a submission for NVCA review. In this interest, we would appreciate a timely response from the NVCA regarding the Terms of Reference for the Proposed Condition Flood Hazard Assessment outlined herein. Following NVCA review of this letter, we request a meeting with the NVCA to discuss the proposed terms prior to the NVCA providing formal comments. We hope this could help expedite the timeline for this study.

The Flood Hazard Assessment Report will be submitted to the NVCA and Township for review and consideration of the recommendations developed therein at which point further discussion may be required.

CLOSING

We hope you find the terms of reference described herein an appropriate approach to addressing the NVCA's concerns regarding flood hazards at the subject site located at 163 & 164 Edward Street in Creemore. If you have any questions, comments, or would like to discuss the terms outlined herein, please don't hesitate to contact the undersigned.

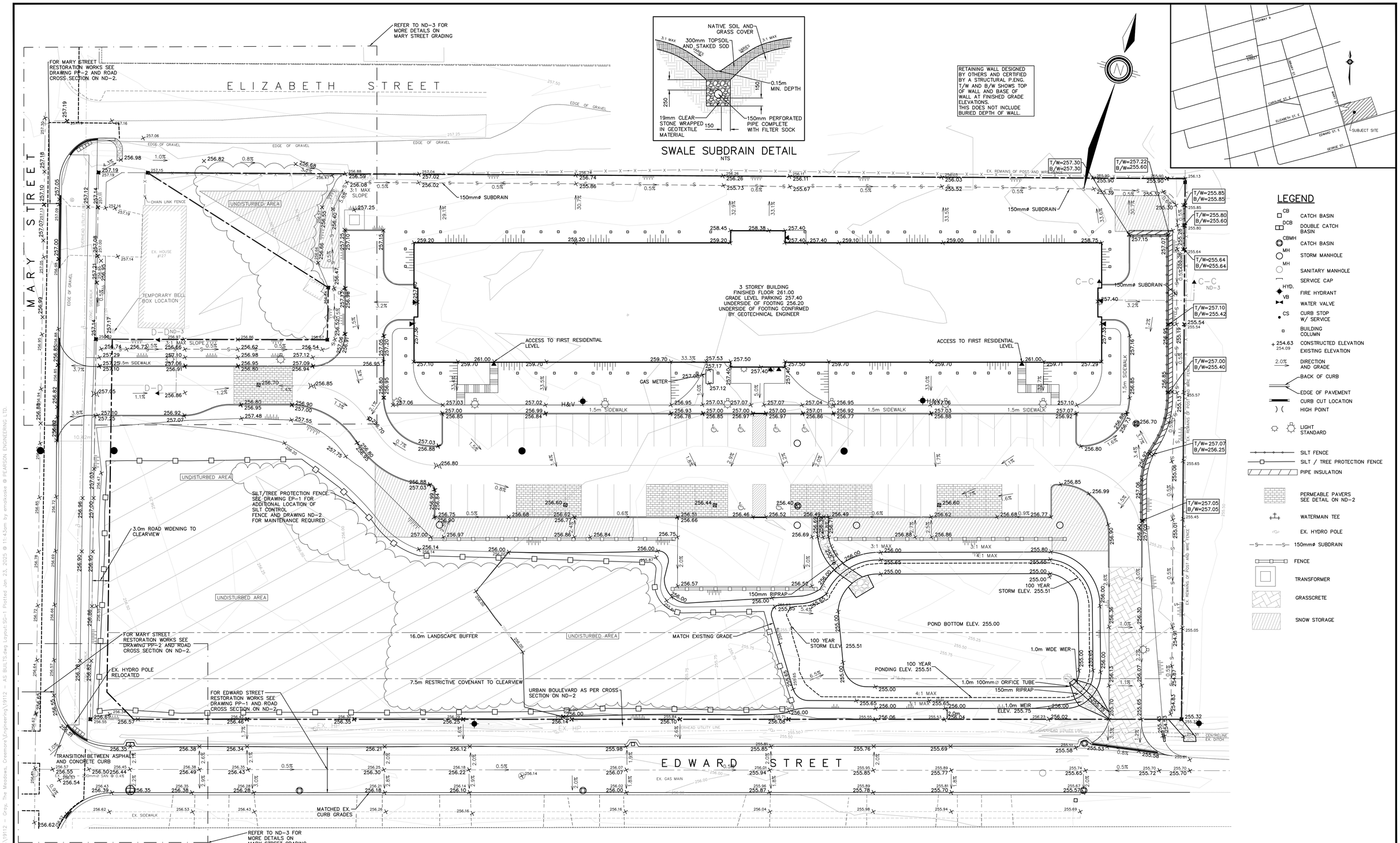
Yours truly,
Tatham Engineering Limited



Jacob Macdonald, P.Eng.
Engineer, Project Manager
JM:ha

copy:	Josée Courtemanche	NVCA	jcourtemanche@nvca.on.ca
	Kasra Modares	LAMB Development Corp.	kasra@elciumcorp.com
	Patti Kennedy	Township of Clearview	pkennedy@clearview.ca
	Danielle Waters	Township of Clearview	dwaters@clearview.ca

O:\Barrie\2019 PROJECTS\419453 - 163 & 164 Edward St E - Creemore\02 - DPA Support\Documents\Correspondence\L - NVCA003 - Flood Hazard Assessment ToR - Final.docx



NO.	REVISION NOTE	DATE	BY
7.	AS-CONSTRUCTED	1/23/25	EM
6.	MARY STREET AS-CONSTRUCTED	11/22/23	DB
5.	COORDINATION WITH TOWNSHIP MARY STREET WORKS	5/01/23	JPE
4.	REVISED AS PER 4TH SUBMISSION COMMENTS	4/19/22	JPE
3.	REVISED AS PER THIRD SUBMISSION COMMENTS	2/24/22	JPE

BENCHMARK

LICENCED PROFESSIONAL ENGINEER
M.W. DEJEAN
Jan 23, 2025
PROVINCE OF ONTARIO

THE BRIX
RESIDENTIAL DEVELOPMENT
121 MARY STREET, CREEMORE

SITE GRADING PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	MWD	HORIZ SCALE	1: 300
DRAWN BY	JPE	VERT SCALE	N/A
CHECKED BY	GMP	DATE	JANUARY 2020
PROJECT #	19112		
DRAWING #	SG-1		
REVISION #	7		

P:\Autodesk Vault\Working Folders\19112 - Gray, The Meadows, Creemore\Engineering\19112 - AS BUILTS.dwg Layout: SG-1 Plotted: Jan 23, 2025 @ 11:43am by emaloske @ PEARSON ENGINEERING LTD

LIMITS OF EDWARD STREET EAST RECONSTRUCTION (SOUTH SIDE URBANIZATION)

EDWARD STREET

GEORGE STREET

CONCESSION ROAD 3

LIMIT OF ROAD WORKS

PROPOSED CENTRELINE OF EDWARD STREET EAST

CURB AND GUTTER AS PER OPSD 600.100 TYP

1.5m SIDEWALK

MATCH TO EXISTING SIDEWALK

OPEN SPACE (BLOCK 27)

BUILDING ENVELOPE AS PER ZONING SETBACKS (TYP)

MATCH EX. GRADE ACROSS ℄ (TYP)

6.0m SERVICING BLOCK (BLOCK 28)

8.0m SERVICING BLOCK (BLOCK 29)

BLOCK 21

BLOCK 22

BLOCK 23

BLOCK 24

BLOCK 25

BLOCK 26

STREET 'A'

SANMH1 SANMH2 SANMH3 SANMH4 SANMH5 SANMH6 SANMH7 SANMH8 SANMH9 SANMH10 SANMH11 SANMH12

CBMH1 CBMH2 CBMH3

STMMH1 STMMH2 STMMH3 STMMH4 STMMH5 STMMH6 STMMH7 STMMH8 STMMH9

DICB1 DICB2 DICB3 DICB4

MW101 MW102 MW103 MW104 MW105

EXISTING 500ø CSP CULVERT W INV: 253.57 E INV: 253.37

EXISTING VINYL CLAD SHED

EXISTING BRICK CLAD DWELLING #107

EXISTING BRICK CLAD DWELLING #111

EXISTING METAL CLAD SHED (TO BE REMOVED)

WOOD CLAD SHED (TO BE REMOVED)

OVERLAND FLOW ROUTE

APPROX. LOCATION OF PROPOSED FLOW SPLITTER AS PER CEMDPR

3.0m MULTI-USE PATH AS PER STD-WW1

14.0m & 9.5m OVERLAND CONVEYANCE CHANNEL @ 0.30% (REFER TO SECTIONS A-A, B-B, C-C, D-D)
BOTTOM WIDTH: 0.2m
TOP WIDTH: VARIES
SIDE SLOPES: 2:1 MAX
DEPTH: 0.85 MIN

POTENTIAL ROAD CONNECTION TO FUTURE DEVELOPMENT TO THE EAST

TEMPORARY DRIVEWAY ACCESS UNTIL EXTENSION OF GEORGE STREET TO THE EAST (TYP.)

PUMPING STATION: REFER TO FIGURE SPS-1 FOR ADDITIONAL DETAILS

DRY SWM POND

SWM POND OUTLET INTO CEMDPR CONVEYANCE CHANNEL
INV: 250.53±

POTENTIAL POND ACCESS ROAD (OPTION 2)

POTENTIAL POND ACCESS ROAD (OPTION 1)

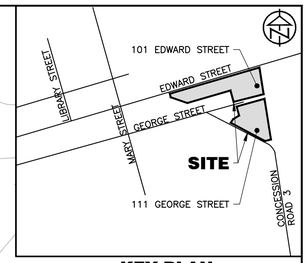
PROPOSED CONDITION REGIONAL FLOODPLAIN LIMIT (REFER TO TATHAM ENGINEERING FLOODPLAIN HAZARD STUDY (JULY 16, 2020) FOR ADDITIONAL DETAIL)

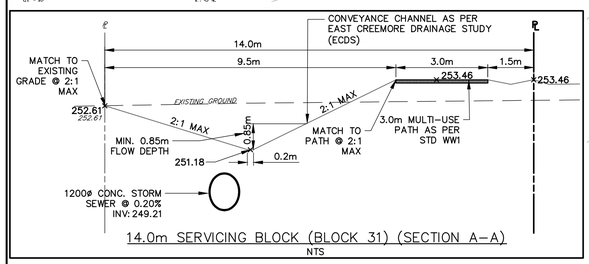
CONCESSION ROAD 3 TO BE RECONSTRUCTED WITH CONVEYANCE DITCH AS PER CREEMORE EAST MASTER DRAINAGE PLAN REPORT (CEMDPR)

NOTE:
GROUNDWATER ELEVATIONS SHOWN RECORDED APRIL 1, 2019.

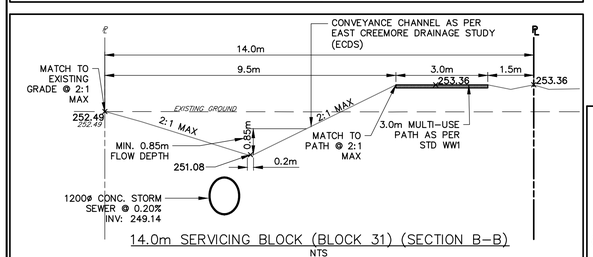
NOTE:
THE UNDERSIDE OF FLOOR SLAB AND ASSOCIATED DRAINS SHALL BE ENTIRELY LOCATED A MINIMUM OF 0.5-0.4 METRES ABOVE THE SEASONAL HIGH GROUNDWATER LEVELS. THE HIGH GROUNDWATER ELEVATION SHALL BE RAISED, WITH CORRESPONDING INCREASE IN CONSTRUCTION ELEVATIONS, IF HIGHER GROUNDWATER CONDITIONS ARE EVIDENT AT THE TIME OF CONSTRUCTION. THE HIGH GROUNDWATER ELEVATION SHALL BE THE HIGHEST DOCUMENTED GROUNDWATER OBSERVATION.

KEY PLAN
NTS

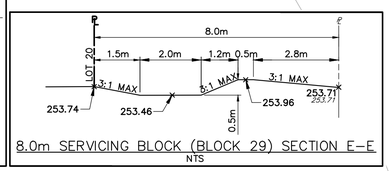




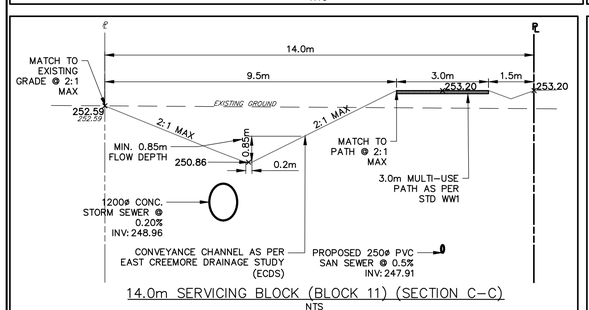
14.0m SERVICING BLOCK (BLOCK 31) (SECTION A-A)
NTS



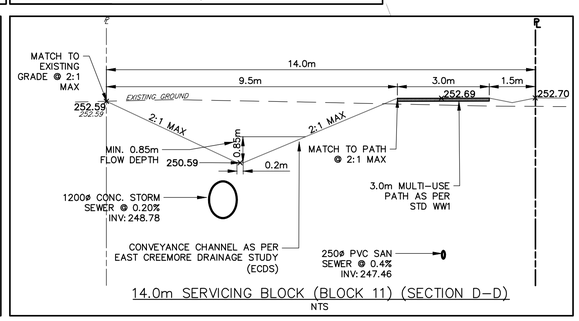
14.0m SERVICING BLOCK (BLOCK 31) (SECTION B-B)
NTS



8.0m SERVICING BLOCK (BLOCK 29) SECTION E-E
NTS



14.0m SERVICING BLOCK (BLOCK 11) (SECTION C-C)
NTS



14.0m SERVICING BLOCK (BLOCK 11) (SECTION D-D)
NTS

LEGEND

- EXISTING PROPERTY LINE
- EXISTING GAS LINE
- EXISTING STORM MAINTENANCE HOLE
- EXISTING SANITARY MAINTENANCE HOLE
- EXISTING CATCH BASIN
- EXISTING LIGHT STANDARD
- EXISTING TRAFFIC LIGHT
- EXISTING PEDESTRIAN SIGNAL
- EXISTING HYDROPOLE
- EXISTING CATCHBASIN MAINTENANCE HOLE
- EXISTING WATER VALVE
- EXISTING GRADE
- EXISTING HYDRANT
- EXISTING VALVE IN CHAMBER
- PROPOSED SANITARY MAINTENANCE HOLE
- PROPOSED DITCH INLET CATCHBASIN
- PROPOSED STORM MAINTENANCE HOLE
- PROPOSED HICKENBOTTOM OUTLET
- PROPOSED CATCHBASIN MAINTENANCE HOLE
- PROPOSED GRADE
- PROPOSED SLOPE
- EXISTING GRADE
- EXISTING CONTOUR
- PROPOSED SWALE
- WELL ID / GROUNDWATER ELEVATION
- PROPOSED REGIONAL FLOODPLAIN

NOT FOR CONSTRUCTION

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BENCHMARKS

TBM1 – ELEVATION 254.32m
TOP OF FIRE HYDRANT ON GEORGE STREET EAST OF CONCESSION ROAD 3.

TBM2 – ELEVATION 259.17
WEST FOUNDATION WALL OF HOUSE#24 ON THE NORTH SIDE OF CAROLINE STREET 90cm FROM THE SW CORNER OF THE BUILDING, 36cm BELOW THE BLOCKS.

NOTES

LEGAL SURVEY INFORMATION SOUTH OF GEORGE ST. SHOWN ON THIS PLAN PREPARED BY MARTIN W. KNISLEY SEPTEMBER 4, 2018. RECEIVED SEPTEMBER 18, 2018.

LEGAL SURVEY INFORMATION NORTH OF GEORGE ST. SHOWN ON THIS PLAN PREPARED BY MARTIN W. KNISLEY SEPTEMBER 3, 2005. RECEIVED APRIL 28, 2017.

TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN PREPARED BY MARTIN W. KNISLEY AUGUST 2005, AUGUST 2018 AND MARCH 2019.

No.	REVISION DESCRIPTION	DATE
1.	ISSUED FOR DRAFT PLAN APPROVAL	MAY 17/19
2.	REISSUED FOR DRAFT PLAN APPROVAL	NOV 26/20

ENGINEER STAMP

EDWARD/GEORGE STREET RESIDENTIAL DEVELOPMENT
TOWNSHIP OF CLEARVIEW

TATHAM ENGINEERING

CONCEPTUAL GRADING PLAN

DESIGN: LB	FILE: 418426	DWG:	
DRAWN: LB	DATE: MAY 2019		SG-1
CHECK: NM	SCALE: 1:750		

Drawing Name: 418426-SG01.dwg, Plotted: Nov 25, 2020

LOUISA ST (COUNTY ROAD 9)

NELSON STREET

WELLINGTON STREET EAST

FRANCIS STREET EAST

MARY STREET

CAROLINE STREET

ELIZABETH STREET

BLOCK 1
BLOCK 2
BLOCK 3
BLOCK 4
BLOCK 5
BLOCK 6
BLOCK 7
BLOCK 8
BLOCK 9 (PARK)
BLOCK 10
BLOCK 11
BLOCK 12
BLOCK 13
BLOCK 14
BLOCK 15
BLOCK 16
BLOCK 17
BLOCK 18
BLOCK 19
BLOCK 20
BLOCK 21
BLOCK 22
BLOCK 23
BLOCK 24
BLOCK 25
BLOCK 26
BLOCK 27
BLOCK 28 - DRAINAGE CHANNEL
BLOCK 29
BLOCK 30
BLOCK 31
BLOCK 32
BLOCK 33
BLOCK 34
BLOCK 36
BLOCK 37
BLOCK 38
BLOCK 39
BLOCK 40
BLOCK 41
BLOCK 42
BLOCK 43
BLOCK 44
BLOCK 45
BLOCK 46 SWM
PHASE 1A
PARK
FUTURE DEVELOPMENT

STREET A
STREET B (NELSON ST)
STREET C (FRANCIS ST)
STREET D
STREET E
STREET F
STREET H
STREET I
STREET J
STREET K
STREET L

MAX 3:1 SLOPING TO MATCH EXISTING

GRADING PLAN FOR BLOCK 23 TO BE CONFIRMED WHEN THE DEVELOPMENT PLAN IS FINALIZED.

DRAINAGE CHANNEL REQUIRES FLOW SPLITTER (DESIGN TO BE FINALIZED IN FUTURE SUBMISSION)

N



KEY PLAN
SCALE: N.T.S.

LEGEND

XXX.X	EX. CONTOUR
+XXX.XX	EX. GRADE
+XXX.XX	PR. ELEVATION
+XXX.XX	PR. ELEVATION (MATCH EX. ELEVATION)
0.5%	PR. SLOPE
0.5%	PR. SWALE SLOPE

50 0m 50 100
SCALE: 1:1500

SURVEY NOTES

EXISTING GROUND CONTOURS GENERATED USING RECEIVED MNT-MNR BASEFILE (2017.05.23).

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4. THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT.
5. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
6. DO NOT SCALE DRAWINGS.

CLEARVIEW

No.	ISSUE	DATE: MMM/DD/YYYY
0	ISSUED FOR OPA/ZBA	APR/06/2023

Engineer

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Engineer

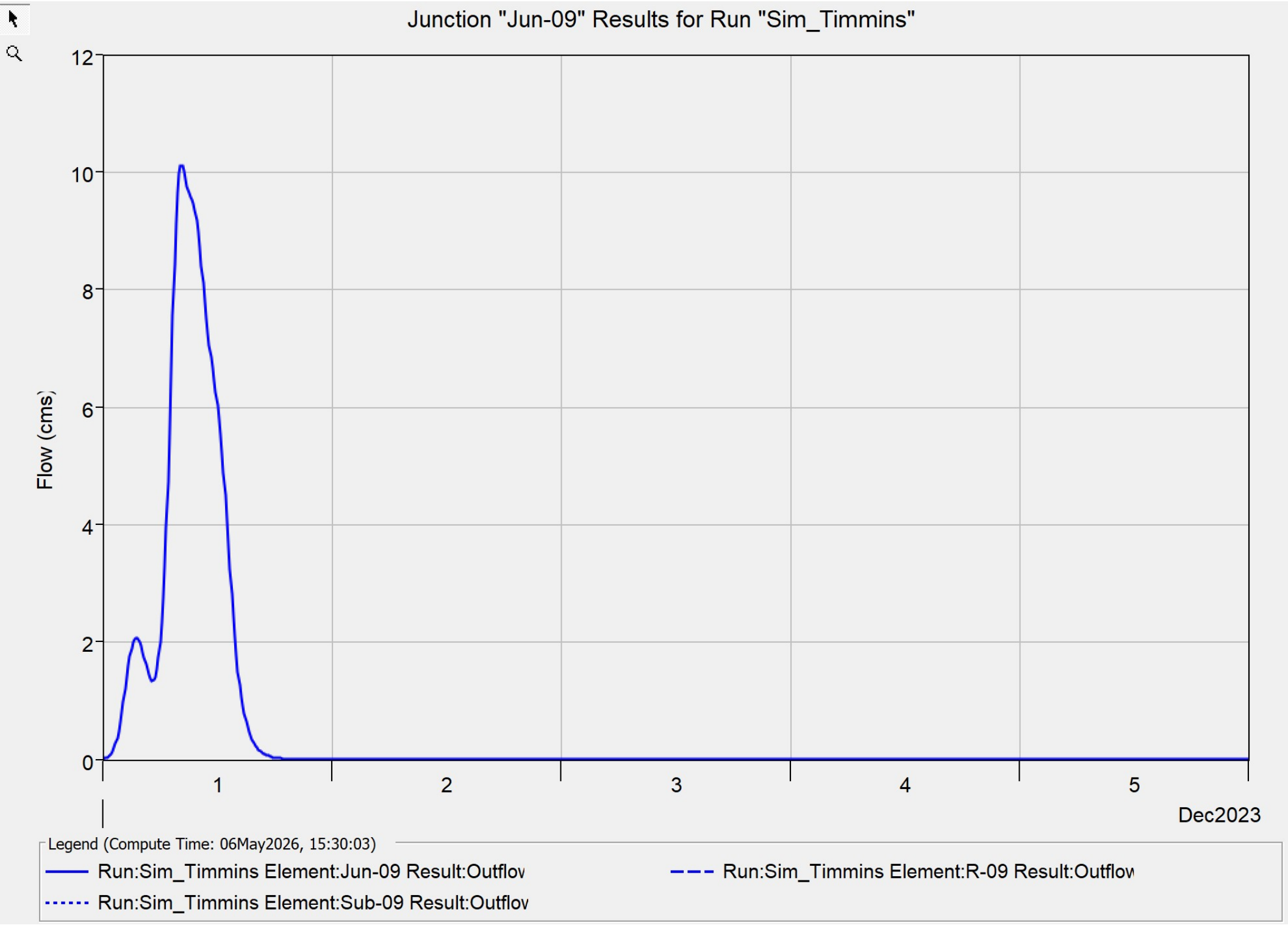
Project
CREEMORE COMMONS
TOWNSHIP OF CLEARVIEW

Drawing
PRELIMINARY GRADING PLAN

CROZIER CONSULTING ENGINEERS
Admiral Building
1 First Street, Suite 200
Collingwood, ON, L9Y 1A1
705-446-3510 T
705-446-3520 F
www.cfcrozier.ca
info@cfcrozier.ca

Drawn By	Design By	Project
C.C./R.D.M.	T.G./B.H.	1000-4419
Check By	Check By	Scale / Drawing
T.G.	B.H.	1:1500 / FIG 3

Appendix B: Hydrology


Junction "Jun-09" Results for Run "Sim_Timmins"
Flow (cms)
12
10
8
6
4
2
0
1
2
3
4
5
Dec2023
Legend (Compute Time: 06May2026, 15:30:03)
Run:Sim_Timmins Element:Jun-09 Result:Outflov
Run:Sim_Timmins Element:R-09 Result:Outflow
Run:Sim_Timmins Element:Sub-09 Result:Outflov

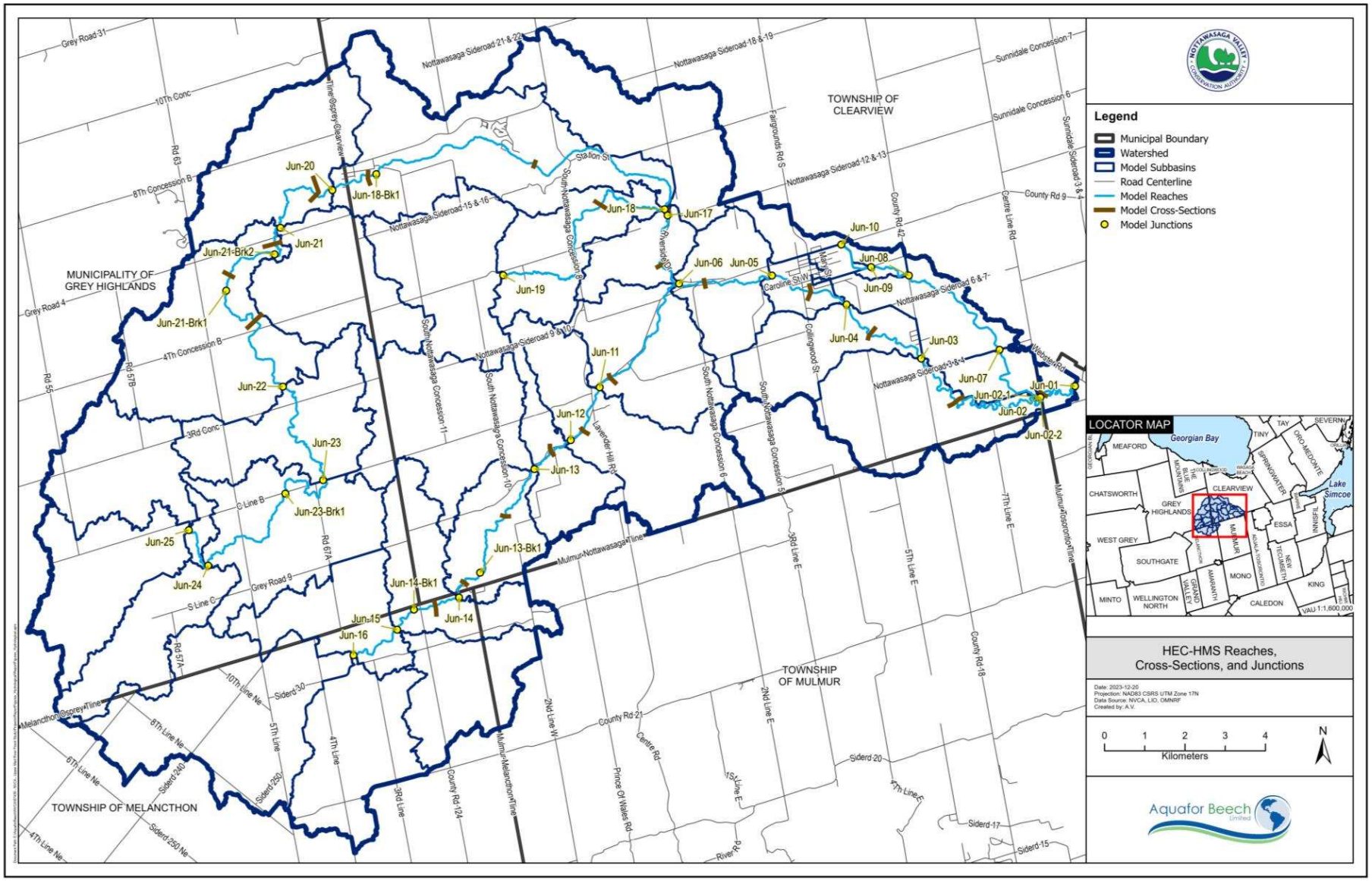
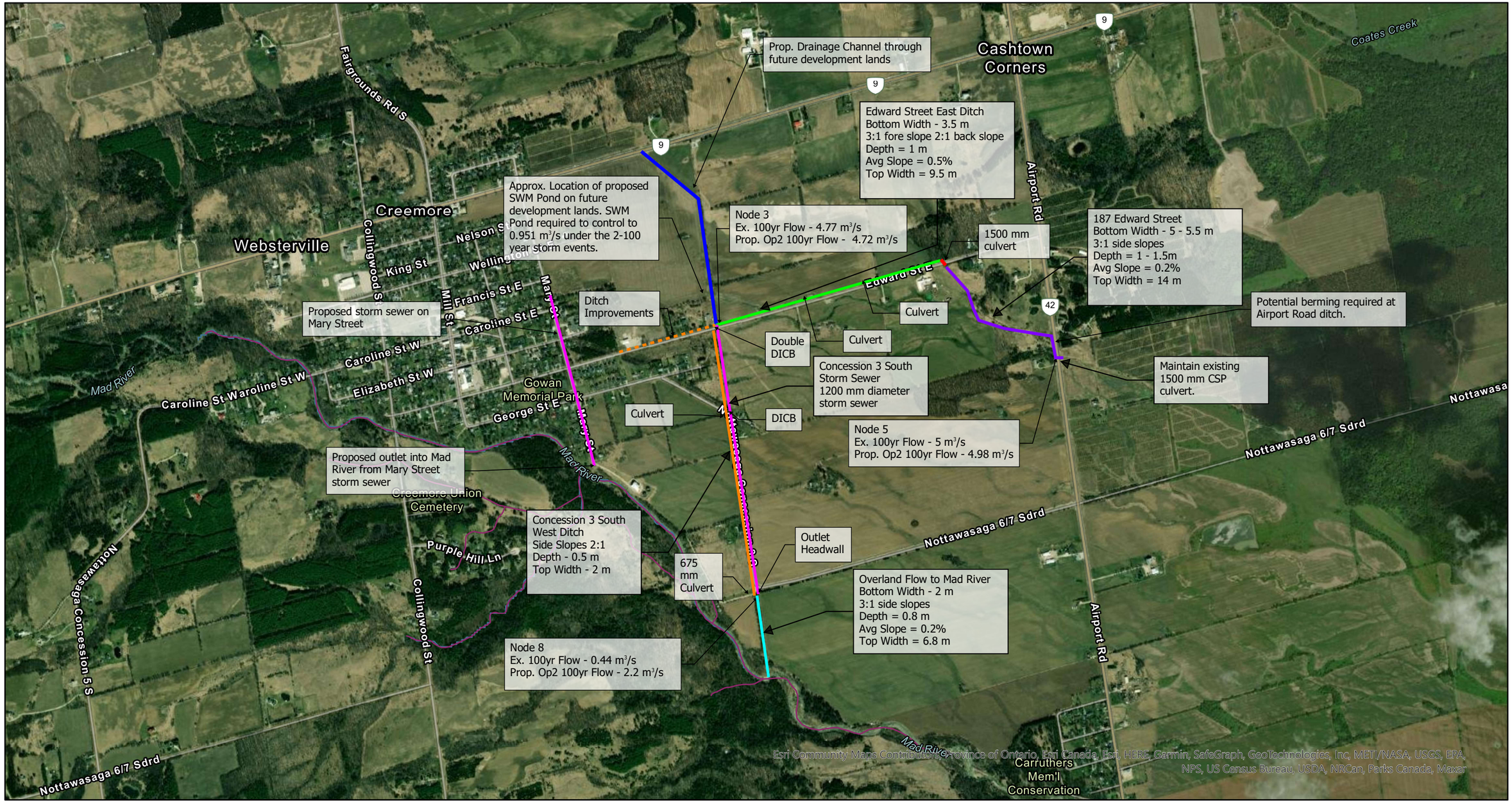


Figure 2-3: HEC-HMS Reaches, Cross-Sections, and Junctions



Datum:	
Coord. System:	
Projection:	
Central Meridian:	
False Easting: m	False Northing: m
Page Orientation: °	Scale Factor:

N
Grid North

0 100 200 300 400 500 600 700 800
Metres

BURNSIDE

Client
TOWNSHIP OF CLEARVIEW

Figure Title
EAST CREEMORE DRAINAGE STUDY
DRAINAGE OPTIONS
OPTION 2

Drawn	Checked	Date	Figure No.
RW	TK	2023/05/10	5
Scale		Project No.	
H 1:		300032517	

File Path: C:\Users\RWalton\Documents\MaryStreet\MaryStreet.aprx Print Date: 2023/05/10 Time: 09:41 AM

EAST CREEMORE DRAINAGE STUDY PEAK FLOWS

Table 7: Existing Peak Flows

Node	Contributing Catchments	Ultimate Outlet	5-Year Flow (m^3/s)	25-Year Flow (m^3/s)	100-Year Flow (m^3/s)	Timmins Flow (m^3/s)
2	3, 4	East	0.99	1.97	3.41	7.81
3	3, 4, 2, EXT1, EXT2	East	2.03	3.20	4.77	11.00
4	3, 4, 2, EXT1, EXT2, 1a	East	1.25	3.03	5.15	13.04
5	3, 4, 2, EXT1, EXT2, 1a, 1b	East	1.33	3.15	5.00	14.83
8	6	South	0.15	0.27	0.44	1.15
9	5	South	0.55	0.97	1.58	4.21
M1	MARY	Mary	1.34	1.93	2.47	1.53

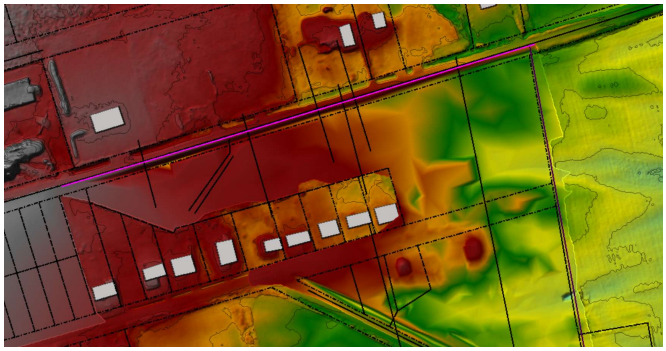
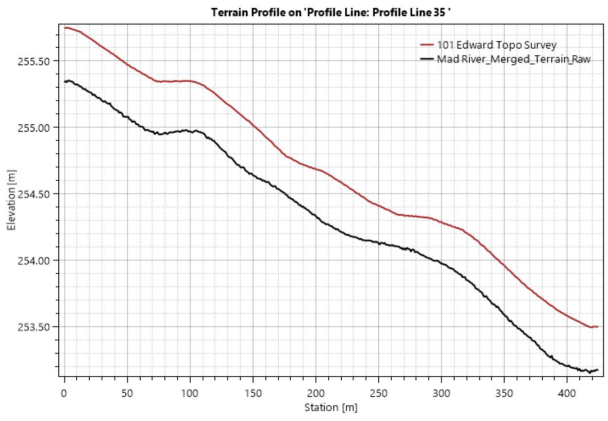
Appendix C: Pre-Development Hydraulic Analysis

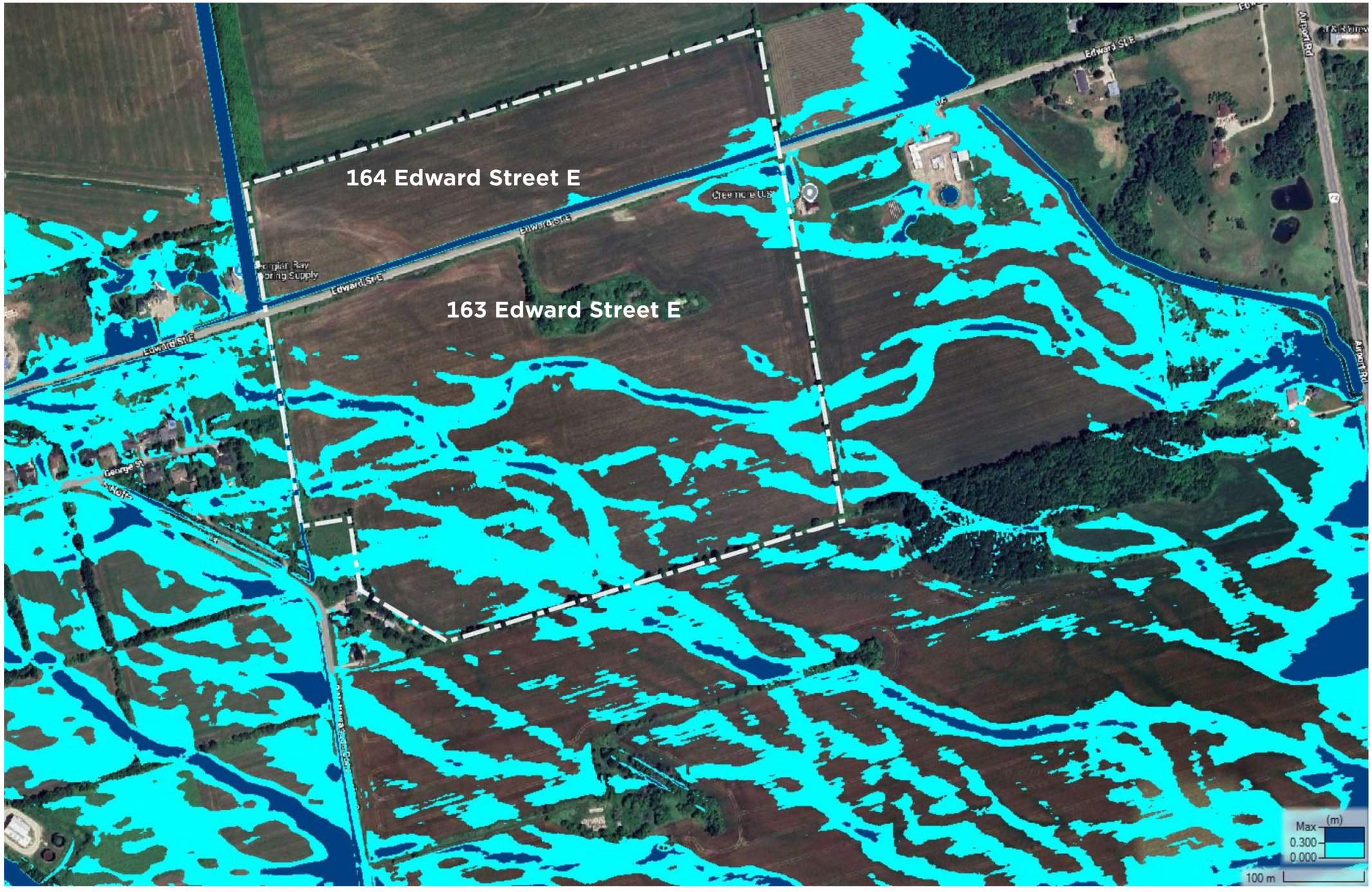
TATHAM ENGINEERING

Datum Adjustment Calculation

Point #	Station (m)	Point Description	Survey Elevation (m)	Existing Model Elevation (m)	Offset (m) (=Survey-Ex. Model)
1	1.525		255.75	255.3415	0.4085
2	44.605		255.511	255.1135	0.3975
3	85.548		255.347	254.9605	0.3865
4	129.703		255.176	254.7905	0.3855
5	173.704		254.806	254.5175	0.2885
6	212.887		254.631	254.252	0.379
7	255.269		254.388	254.1305	0.2575
8	297.65		254.294	253.999	0.295
9	340.031		254.048	253.6775	0.3705
10	384.012		253.682	253.294	0.388

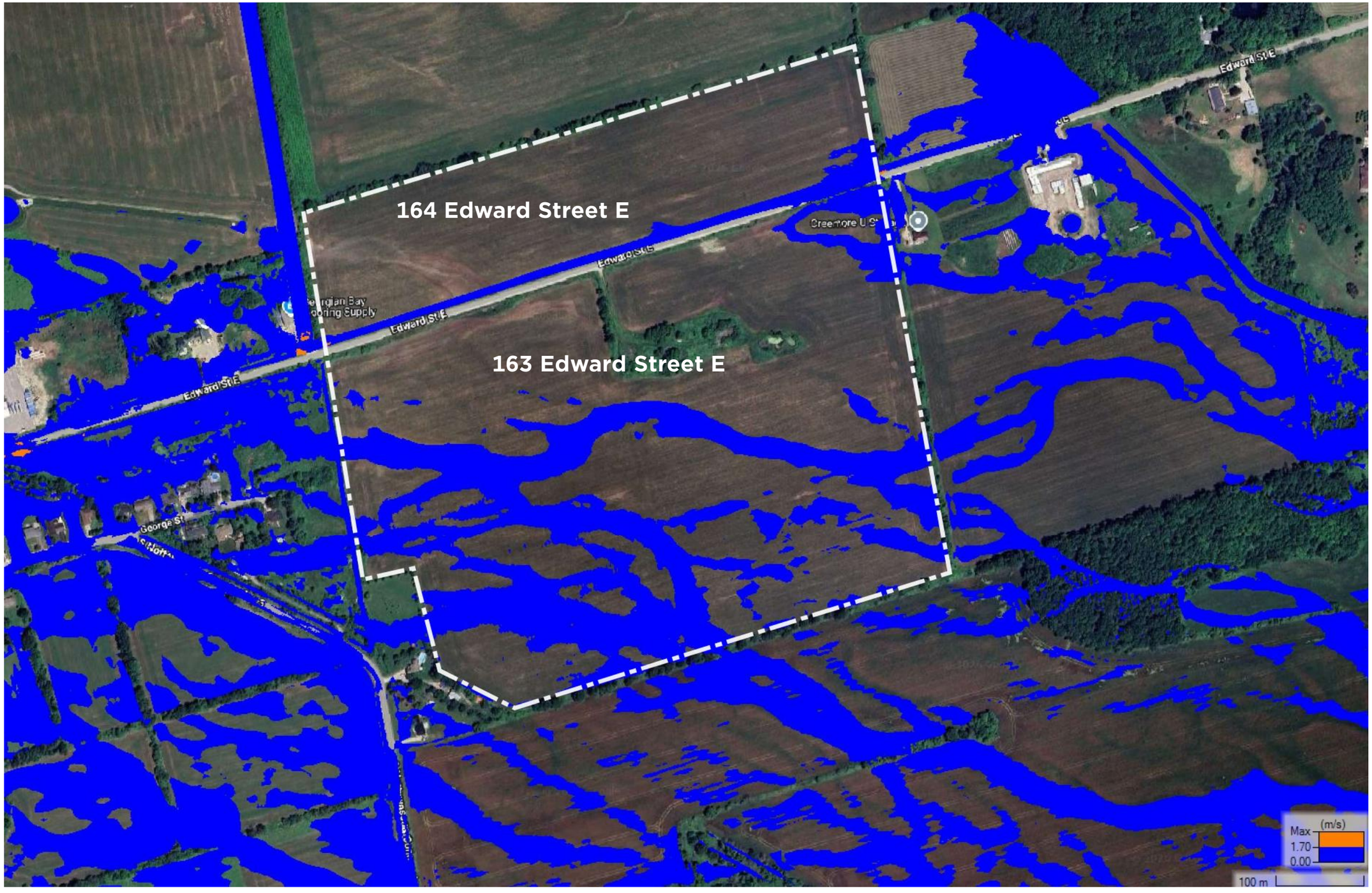
Average Offset/Datum Adjustment (m)	**0.35565**

Line Description	**Image**
Edward Street	
Surface Profiles	



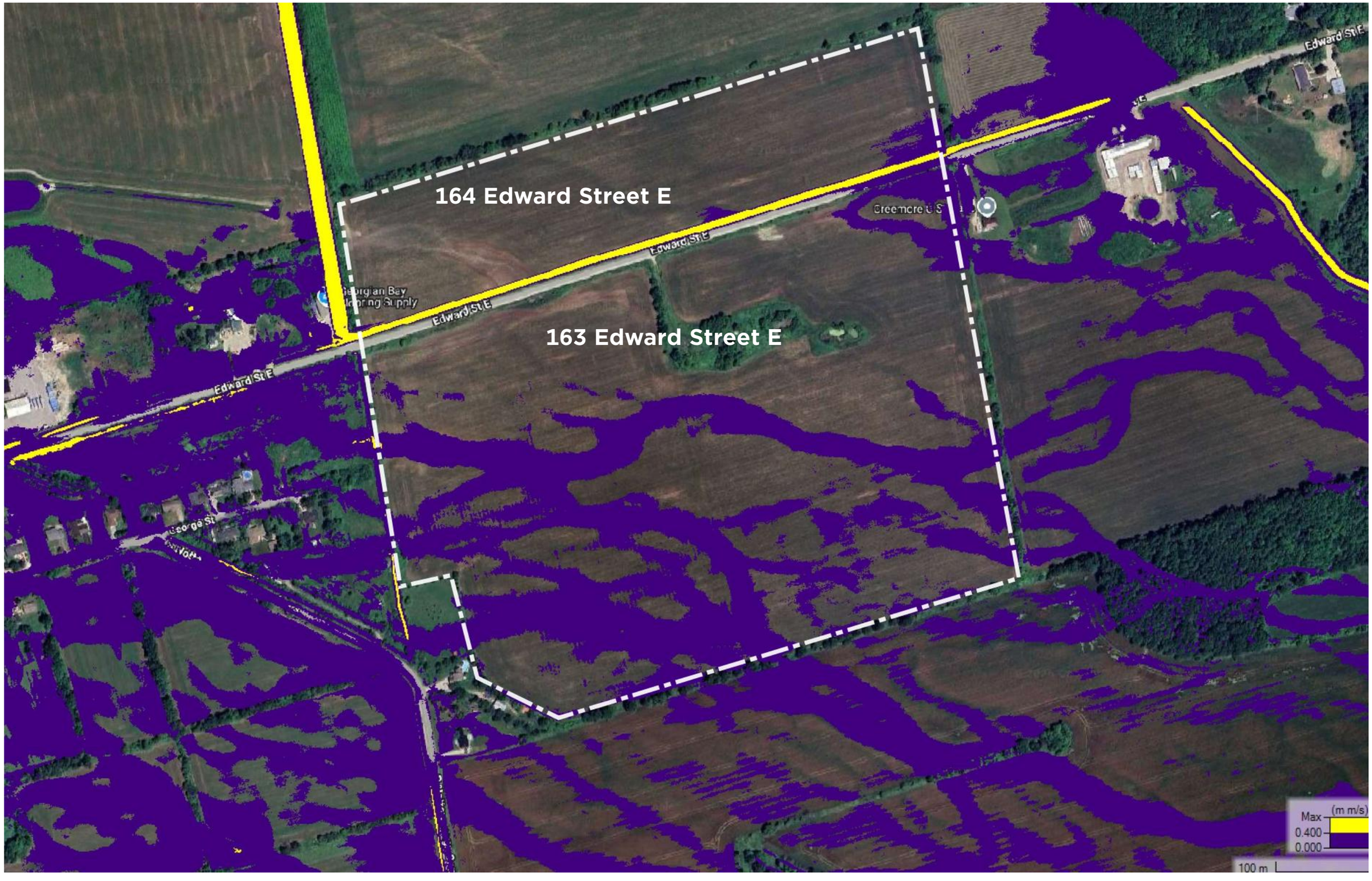
163 & 164 Edward Street East

Figure 1: Pre-Development Conditions – Maximum Depth



163 & 164 Edward Street East

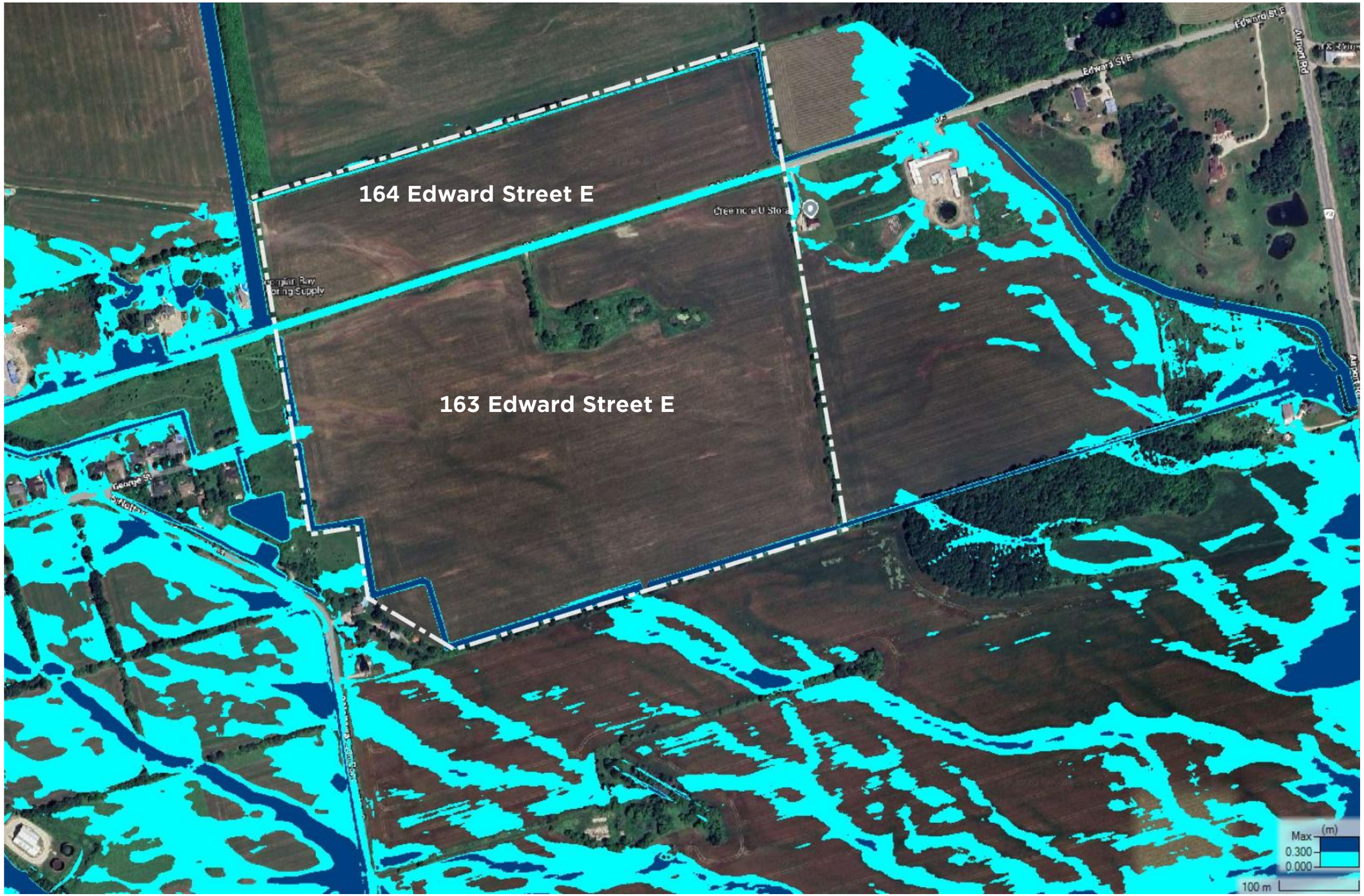
Figure 2: Pre-Development Conditions – Maximum Velocity



163 & 164 Edward Street East

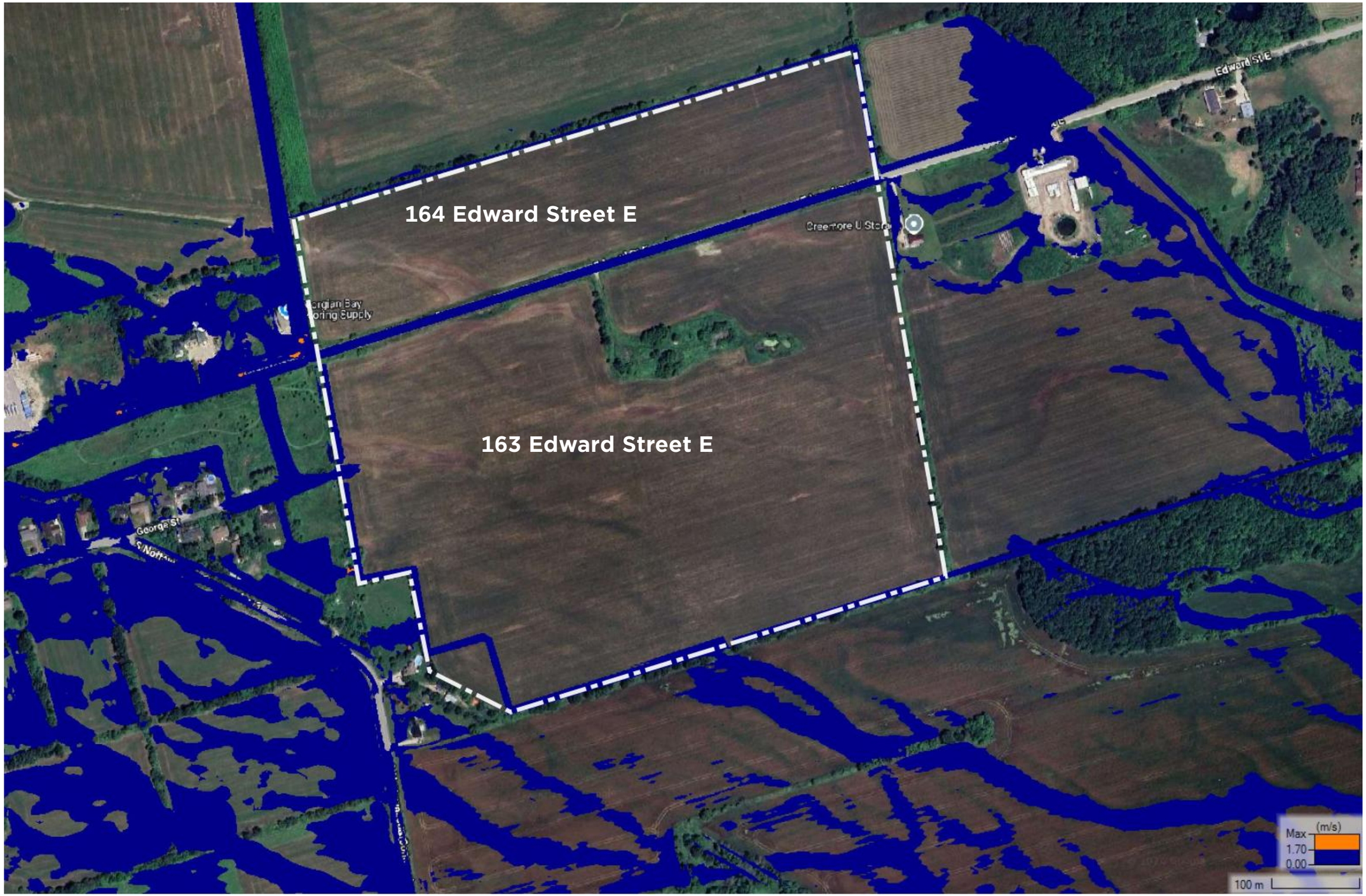
Figure 3: Pre-Development Conditions – Maximum Depth-Velocity Product

Appendix D: Post-Development Hydraulic Analysis



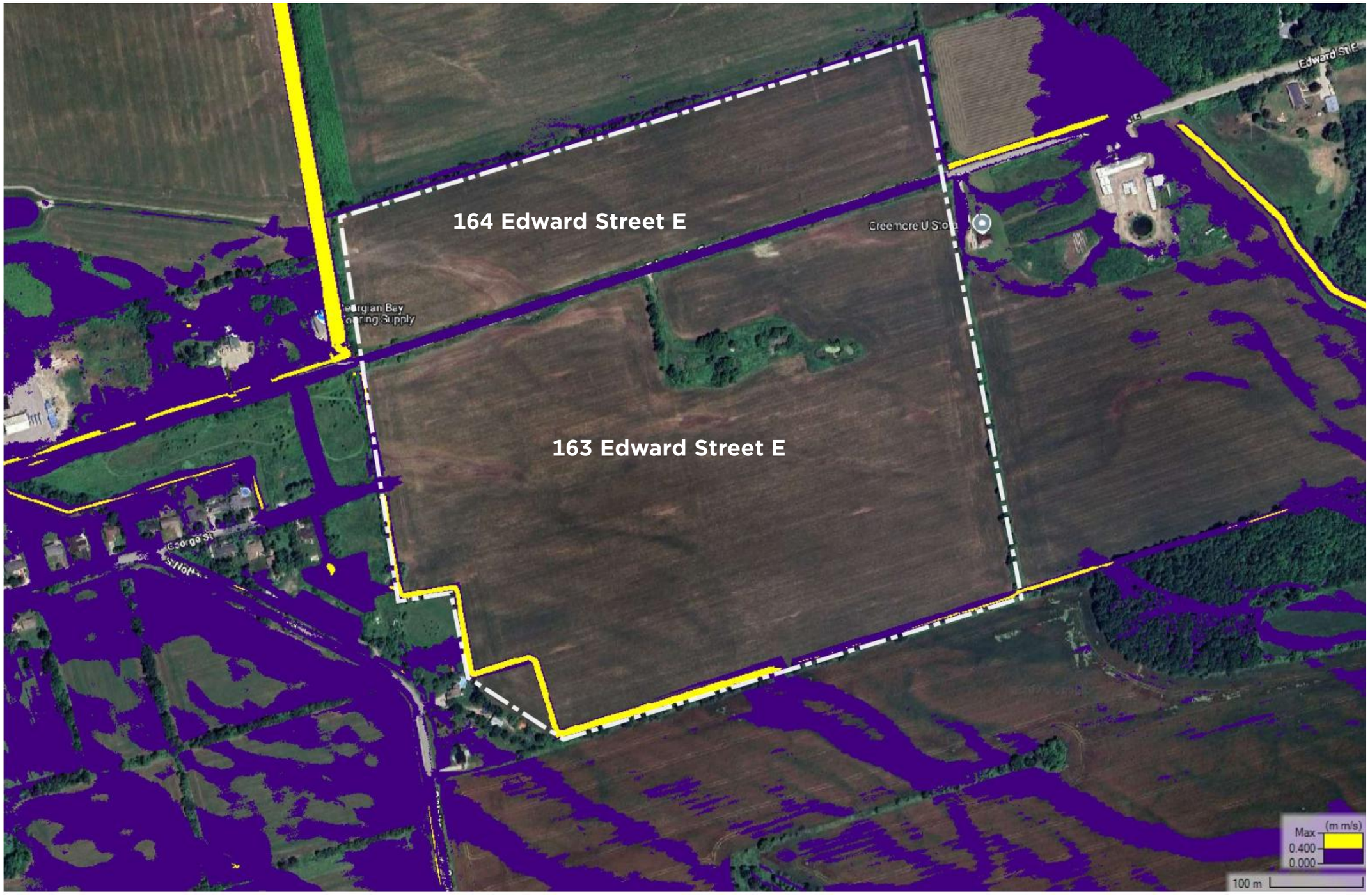
163 & 164 Edward Street East

Figure 4: Post-Development Conditions – Maximum Depth



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Figure 5: Post-Development Conditions – Maximum Velocity



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Figure 6: Post-Development Conditions – Maximum Depth-Velocity Product



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Figure 7: Post-Development Conditions (50% Blocked Scenario) – Maximum Depth



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Figure 8: Post-Development Conditions (50% Blocked Scenario) – Maximum Velocity



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Figure 9: Post-Development Conditions (50% Blocked Scenario) – Maximum Depth-Velocity Product