Trailsedge East Phase 4

Functional Servicing Report

Stantec Project No. 160401250

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Prepared for:

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Sign-off Sheet

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) has been commissioned by Richcraft Group of Companies Inc. (Richcraft) to prepare the following Functional Servicing Report for Phase 4 of the Trailsedge East Subdivision in support of a Draft Plan of Subdivision application. The subject property is located northwest of the intersection of Mer Bleue Road and Renaud Road within the southwest quadrant of the Gloucester East Urban Community (EUC) Phase 3 CDP study area in the City of Ottawa. The property is currently zoned Development Reserve (DR) and is bordered by Mer Bleue Road to the east, Phases 1-3 of the Trailsedge East Subdivision to the south, Fern Casey Street to the west, and a proposed BRT and hydro corridor along Brian Coburn Boulevard to the north. The property is indicated in **Figure 1** below. Phase 4 comprises approximately 26.3 ha of land, with proposed development consisting of 142 single family units, 177 townhomes, 116 Back-to-Back townhomes, and a 7.04ha mixed-use residential block. In addition, commercial development has been proposed for the 4.25ha Block 197. A 0.43Ha community park will be established within Phase 4 of the development. The Trailsedge East Block 193-194 preliminary servicing analysis has been conducted independently of Phase 4, the results of which have been considered and integrated into the overall servicing analysis.

The intent of this report is to build on the servicing principles outlined in the Master Servicing Study (MSS) for East Urban Community Phase 3 Area Community Design Plan (DSEL June 2020) to create a servicing strategy specific to the subject property. The report will establish criteria for future detailed design of the subdivision, in accordance with the associated background studies, City of Ottawa Guidelines, and all other relevant regulations.

Introduction

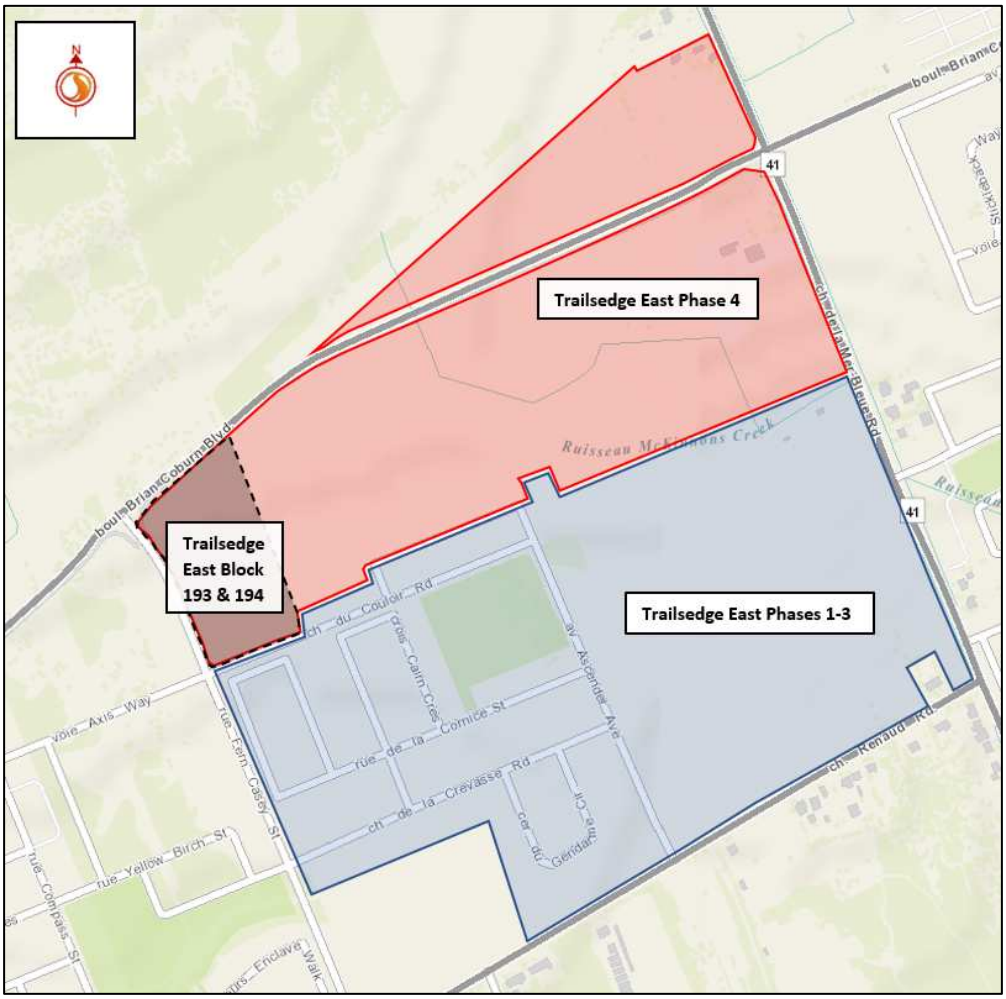

Figure 1: Key Map of Trailsedge East Subdivision

2.0 REFERENCES

The following documents were referenced in the preparation of this report:

- Gloucester East Urban Community (EUC) Infrastructure Servicing Study Update (In Support of the EUC Community Design Plan), Stantec Consulting Ltd., March, 2005.
- Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing, Stantec Consulting Ltd., July, 2006.
- East Urban Community Pond No.1 Design Brief, Stantec Consulting Ltd., April 2008.
- Geotechnical Investigation – Proposed Residential Development Eden Park – East Portion – Renaud Road, Paterson Group Inc., November 15, 2016.
- Proposed Trailsedge East Development Community Transportation, Castleglenn Consultants, October 2016.
- Design Brief for the Reconstruction of the East Urban Community Stormwater Management Pond 1 for the Trailsedge Subdivision, David Schaeffer Engineering Ltd., December 2012.
- Stormwater Management Report for the Trailsedge West Subdivision, J.F. Sabourin and Associates Inc., January 2015.
- Trailsedge Subdivision / Proposed Modification of Mud Creek Channel Between Belcourt Extension and Compass Street, J.F. Sabourin and Associates, January 2015.
- Design Brief for the Trailsedge West, David Schaeffer Engineering Ltd., January 26, 2015.
- Design Brief – Minto Trailsedge Phase II, IBI Group, February 2015.
- City of Ottawa Sewer Design Guidelines, City of Ottawa, 2014 (and all subsequent technical bulletins).
- City of Ottawa Design Guidelines – Water Distribution, Infrastructure Services Department, City of Ottawa, First Edition, July 2010 (and all subsequent technical bulletins).
- East Urban Community (EUC) Phase 3 Master Servicing Study, David Schaeffer Engineering Ltd. (DSEL), June 2020.
- Trailsedge East – Functional Servicing Report, Stantec Consulting Ltd., August 2017.
- Trailsedge East Phase 1 – Detailed Servicing and Stormwater Management Report, Stantec Consulting Ltd., August 2019.
- Trailsedge East Phase 2-3 – Detailed Servicing and Stormwater Management Report, Stantec Consulting Ltd., 2021.
- Trailsedge East Block 193-194 – Servicing and Stormwater Management Report, Stantec Consulting Ltd., 2021.

3.0 POTABLE WATER SERVICING

3.1 EXISTING CONDITIONS

The proposed development is located within Zone 2E of the City of Ottawa's water distribution system. This zone is fed by the Forest Ridge Pump Station, with the Innes Road elevated storage tank providing balancing storage for peak flows and demands. A 300mm diameter watermain exists along Ascender Avenue and Couloir Road immediately south of the Trailsedge East Phase 4 development area, and a 400mm diameter main exists along Mer Bleue Road between Renaud Road and Brian Coburn Boulevard, and north of the Hydro One Corridor (HEPC). 400mm and 600mm watermains exist further north along Innes Road. A 600mm watermain also exists north of the site along the HEPC.

3.2 PROPOSED WATERMAIN SIZING AND LAYOUT

The proposed watermain alignment and sizing for the development is shown on **Drawing WTR-1** with 203mm diameter and 305mm diameter watermain following the alignment of the road network within the subject property. Similarly to the assumptions made in the East Urban Community Phase 3 Area Master Servicing Study (DSEL, 2020), the proposed network considers existing connections to the watermains within Fern Casey Street and Mer Bleue Boulevard from Phases 1-3 of the Trailsedge East development continuing to a 300mm watermain loop from Alpenstock Avenue and Ascender Avenue extending to the mixed-use area north of Brian Coburn. The watermain network plan from the master servicing study is included in **Appendix A**. The pipe layout and sizing for the development is preliminary and is to be verified upon detailed hydraulic analysis for the development.

3.2.1 Connection to Existing Infrastructure

Potable water supply for Phase 4 of the Trailsedge East Subdivision is to be provided via existing mains located on Couloir Road, d'Arête Way, Ascender Avenue. Additionally, connections to future mains located on the north end of Crux Road, and the north end of Alpenstock Avenue have been proposed to service the development. **Drawing WTR-1** shows the location of the connection points to the existing and proposed infrastructure.

3.2.2 Ground Elevations

The proposed ground elevations of the development range from approximately 88.3m and 89.8m. Preliminary grading and elevations have been determined for the site and included on **Drawing GP-1**.

3.2.3 Domestic Water Demand

Phase 4 of the Trailsedge East Development contains a total of 142 single family units, 177 townhome units, and 116 Back-to-Back townhome units. Phase 4 will include parcels for commercial development and mixed-use development. The future Mixed-Use development is expected to contribute both commercial and residential flows to overall demands. The 7.04ha mixed use block was assessed at an overall unit density

of 80 units/ha, with additional allowance for the entire block area at the anticipated commercial demand rate to account for potential first-floor commercial uses.

Domestic water demands for the development were estimated using the City of Ottawa's Water Distribution Design Guidelines. For residential developments, the average day (AVDY) per capita water demand is 280 L/cap/d. For maximum day (MXDY) demand, AVDY was multiplied by a factor of 2.5 and for peak hour (PKHR) demand, MXDY was multiplied by a factor of 2.2. For commercial and institutional use, the AVDY is based on the area of land use and is shown in the following tables. For MXDY demand, AVDY was multiplied by a factor of 1.5 and for PKHR demand, MXDY was multiplied by a factor of 1.8. The calculated residential water consumption, and commercial and future mixed-use water consumption is represented in **Table 1** and **Table 2**, respectively:

It is also of note that 6 singles, 10 back-to-back units, and 23 townhomes are proposed to be serviced directly from mains constructed as part of Phase 1 of the Trailsedge East development, and have been omitted from the tables below. Demands from these units have been previously considered in analysis of prior phases.

Table 1: Residential Water Demands

Unit Type	Units	Person/Unit	Population	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Singles	136	3.4	462	1.5	3.7	8.2
Townhomes	154	2.7	416	1.3	3.4	7.4
Back-to-Back Townhomes	106	2.7	286	0.9	2.3	5.1
Mid-High Density (B 193/194)	186	2.4	446	1.4	3.6	8.0
Apartments (MU Residential)	563	1.8	1014	3.3	8.2	18.1
TOTAL:	**1145**		**2625**	**8.5**	**21.3**	**46.8**

Table 2: Commercial & Mixed-Use Area (MUC) Water Demands

Land Use Type	Daily Rate of Demand (L/ha/day)	Area	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Commercial (Block 197)	28,000	4.25	1.4	2.1	3.7
Commercial (Block 198/199)	28,000	7.04	2.3	3.4	6.2
TOTAL:			**3.7**	**5.5**	**9.9**

3.3 LEVEL OF SERVICE

3.3.1 Allowable Pressures

The City of Ottawa Water Distribution Design Guidelines state that the desired range of system pressures under normal demand conditions (i.e. basic day, maximum day and peak hour) should be in the range of 350 to 552 kPa (50 to 80 psi) and no less than 275 kPa (40 psi) at the ground elevation in the streets (i.e. at hydrant level). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way is 552 kPa (80 psi). As per the Ontario Building Code (OBC) & Guide for Plumbing, if pressures greater than 552 kPa (80 psi) are anticipated, pressure relief measures are required. The maximum pressure at any point in the distribution system in unoccupied areas shall not exceed 689 kPa (100 psi). Under emergency fire flow conditions, the minimum pressure objective in the distribution system is 138 kPa (20 psi).

3.3.2 Fire Flow

The Master Servicing Study model applied a uniform fire flow requirement of 15,000L/min (250L/s) for the EUC Phase 3 Area CDP to size trunk infrastructure. The estimate provided is considered both conservative and representative of the different land uses in Phase 4 of the development and ensures that local distribution mains are limited to 200mm in diameter. As per the report: *Hydraulic Capacity and Modelling Analysis East Urban Community Mixed-Use Centre Development* (GeoAdvice, July 2018), included in Appendix B of the MSS, the modelling results indicate that the development can be adequately serviced by the proposed watermain network. As outlined in the MSS, the distribution system will meet the minimum and maximum service pressure criteria under normal domestic flow delivery, and emergency fire flow conditions.

Recent boundary conditions were obtained to verify anticipated pressures at watermain connections to the existing Phases 1-3 of Trailsedge East (include in **Appendix A**). In comparison to the GeoAdvice model, anticipated connections #1 and #2 are in similar connection locations as junction JCT-67, connections #3 and #4 to JCT-68, and connection #5 to JCT-69. Based on the 250L/s fire flow scenario, the GeoAdvice model anticipated a residual pressure of 22.8psi (157kPa), 38.1psi (263kPa) and 34.2psi (236kPA) for JCT-67, JCT-68 and JCT-69 respectively. Per recent boundary conditions request, the anticipated residual pressures at these nodes for the 250L/s fire flow scenario are represented as 42.8psi, 41.0psi and 41.4psi. As such, the GeoAdvice model results can be seen to be conservative for the current watermain operating conditions.

A site-specific analysis using the Fire Underwriters Survey (FUS) methodology found a maximum fire flow of 13,000 L/min (217 L/s) for Phase 4 of the Trailsedge East Subdivision using 5-unit clusters of back-to-back townhomes. Back-to-back townhome blocks containing 10 or more units will be required to maintain a minimum 2-hour fire separation between unit clusters. Refer to **Appendix A** for FUS fire flow calculations for typical connected back-to-back townhouse requirements. Given the required fire flow is less than that previously assumed by the MSS, no negative impacts to the results of the GeoAdvice model are anticipated.

As per the City's technical bulletin ISDTB-2014-02 (City of Ottawa, 2014), fire flow shall be capped at 10,000 L/min for traditional side-by-side townhomes constructed in accordance with the OBC and with a minimum separation of 10 meters between the back of adjacent units. According to the assumptions and analysis outlined within the MSS, the proposed watermain network is expected to adequately service Phase 4 of the development.

3.4 POTABLE WATER SUMMARY

The proposed piping alignment and sizing can achieve the required level of service within Phase 4 of Richcraft's Trails Edge East subdivision. Based on the hydraulic analysis created at the Master Servicing level, the following conclusions were made:

- The proposed water distribution system is recommended to include a combination of 305mm and 203mm diameter pipes;
- During peak hour conditions, the proposed system is capable of operating above the minimum pressure objective of 275kPa (40psi);
- During fire conditions, the proposed system can provide sufficient fire flows (15,000L/min and above) while maintaining a residual pressure of 138kPa (20 psi) in Phase 4 of the Trailsedge East development. Sizing of internal mains on local streets will be coordinated to ensure a minimum fire flow of 10,000 L/min may be achieved.

4.0 WASTEWATER SERVICING

4.1 BACKGROUND

As indicated in the Master Servicing Study (MSS) for EUC Phase 3 Area CDP, wastewater servicing for the Trailsedge East Development is conveyed to the Forest Valley Trunk Sewer (FVT) via a free flow gravity trunk running along Renaud Road to the Forest Valley Pumping Station. The MSS outlines the sanitary servicing requirements for the subject property, which identify an integrated network within Minto and further Richcraft lands to the west, eventually connecting to the newly constructed 600 mm trunk sewer extension along Renaud Road recommended by the MSS. The Trailsedge East Phase 1 – Servicing and Stormwater Management Report further detailed assumed contributing flows from Phase 4 through sewers on Ascender and Arete Way. The Sanitary Drainage Plan and sanitary sewer design sheet for the existing Trailsedge East Phase 1 development is included in **Appendix B**.

The Design Brief – Minto Trailsedge Phase II report (IBI Group, 2015) identifies an external contribution to their subdivision based on a future population of 4,212, which includes drainage from the entirety of the Trailsedge East development phases 1-4, as well as future lands forming a mixed-used community (MUC) identified within the EUC MSS.

4.2 DESIGN CRITERIA

As outlined in the City's Sewer Design Guidelines, the following design parameters were used to calculate estimated wastewater flow rates and to preliminarily size on-site sanitary sewers:

- Minimum Full Flow Velocity – 0.6 m/s
- Maximum Full Flow Velocity – 3.0 m/s
- Manning's roughness coefficient for all smooth walled pipes – 0.013
- Single Family Persons per unit – 3.4
- Townhouse Persons per unit – 2.7
- Extraneous Flow Allowance – 0.33 L/s/ha
- Residential Average Flows – 280 L/cap/day
- Commercial/Mixed Use Flows – 28,000 L/ha/day
- Harmon Correction Factor – 0.8
- Maintenance hole Spacing – 120 m
- Minimum Cover – 2.5 m

In addition, a residential peak factor based on Harmon's Equation was used to determine the peak design flows. Institutional and commercial areas were assigned a peaking factor of 1.5 where commercial areas contribute greater than 20% of the total tributary area to each sanitary sewer per Ottawa's Sewer Design Guidelines.

4.3 PROPOSED SERVICING

Phase 1 of the Trailsedge East Subdivision is currently serviced by a network of gravity sewers which direct wastewater flows westerly to the trunk sewer within Fern Casey Street within the adjacent Minto development. Sanitary sewers within Phase 4 of the Trails Edge East Subdivision are to flow westerly and connect to the sanitary sewer network established in Phase 1. Flows from mixed use lands to the north will be conveyed through Phase 4 sewers crossing Brian Coburn Boulevard under direction of the MSS. The proposed sanitary sewer design sheet and associated Sanitary Drainage Area Plan can be found in **Appendix B** & **Appendix E**. The proposed sanitary sewer design indicates two (2) connection points to the recently constructed sanitary sewers within Phase 1.

The tables below do not consider additional flows from 6 single units, 23 townhomes, and 10 back-to-back townhomes within Phase 4 that discharge directly to previously constructed sewers within Phase 1, and whose flows have been previously included within detailed design reports for Phases 1-3.

The connection points and associated flows are summarized in **Table 3** below. Allocated flows for the available connection points based on the EUC Phase 3 MSS are noted in **Table 4**.

Table 3: Wastewater Connections to Existing Network

MH ID	Residential Area (ha)	Commercial Area (ha)	Residential Population	Total Flow (L/s)	Sewer Dia. (mm)
101	3.30	0.00	513[1]	6.7	200
104	14.31	11.29	2108[2]	34.8	375
Total	**17.61**	**11.29**	**2621**	**41.5**	

1. Residential population for Blocks 193/194 per *Trailsedge East Block 193-194 – Servicing and Stormwater Management Report*. Remainder of units based on current draft plan.
2. Population for Mixed Use block 198 per *EUC Phase 3 MSS*. Remainder of sanitary contributions per unit configuration as shown on current draft plan.

Table 4: Wastewater Connections per EUC Phase 3 MSS

MH ID	Total Area (ha)	Commercial Area (ha)	Residential Population	Total Flow (L/s)	Sewer Dia. (mm)
302A	2.28	0.00	27	-	375
302A	19.28	7.98	798	-	375
Total	**21.56**	**7.98**	**2392**	**38.1**	

Based on sanitary sewer design sheets for downstream areas as provided in the Trailsedge East Phase 1 Servicing Report (Stantec, 2019), minor increase in peak flows from the proposed development and upstream contributing areas from that previously assumed in the MSS (**3.4L/s**) can be accommodated within the downstream sewer network.

5.0 STORMWATER MANAGEMENT

5.1 OBJECTIVES

The objective of this stormwater management plan is to determine the measures necessary to control the quantity/quality of stormwater released from the proposed development to criteria established in the *Master Servicing Study (MSS) for East Urban Community Phase 3 Area Community Design Plan* and the earlier *Trailsedge East Functional Servicing Report* (Stantec, August 2017)

5.2 SWM CRITERIA AND CONSTRAINTS

Criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (2012), through the various background documents and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

General

- Use of the dual drainage principle (City of Ottawa).
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff. (City of Ottawa).
- Assess impact of 100-year event and climate change event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system (City of Ottawa).

Storm Sewer & Inlet Controls

- Proposed site to discharge the existing storm sewer stubs at Ascender Avenue (Stantec).
- Minor system inflow to be restricted for all contributing areas to capture at minimum the 2-year event for local streets, or to the 5-year event along proposed collector roads (City of Ottawa).
- Boundary conditions for the site outlets per PCSWMM model prepared for Trailsedge East Phase 1 Subdivision (Stantec). Identical values have been carried forwards per PCSWMM model prepared for Trailsedge East Phases 2-3 Subdivision (Stantec).
- 100-year Storm HGL to be a minimum of 0.30 m below building foundation footing (City of Ottawa).
- Climate Change event HGL to be below building foundation footing (City of Ottawa)

Surface Storage & Overland Flow

- Building openings to be a minimum of 0.15 m above the 100-year water level within adjacent ROWs (City of Ottawa).
- No overland flow was originally accounted for to Ascender Avenue from Phases 2-3 up to the 100-year event. Overland flow allowances made to Ascender Avenue for climate change (100yr+20%) event (Stantec).
- Subdivision to provide sufficient storage to contain at minimum 30 m3/ha (IBI/JFSA).
- No surface ponding is to be permitted on local roads during the 2-year storm event, and no surface ponding is to be permitted on collector roads during the 5-year storm event (City of Ottawa).

- Maximum depth of flow under either static or dynamic conditions shall be less than 0.35m for design storm events (i.e. up to 100-year storm) (City of Ottawa).
- Minimum clearance depth of 0.30m to be provided from rear yard spill elevation to the ground elevation at the adjacent building envelope (City of Ottawa).
- Minimum clearance depth of 0.15m to be provided from spill elevations within the proposed rights-of-way to building envelopes in proximity of overland flow routes or ponding areas.
- Water must not encroach upon proposed building envelopes and must remain below all proposed building openings during the climate change event (City of Ottawa).
- Provide adequate emergency overflow conveyance off-site (City of Ottawa).
- No rear-yard ponding volumes to be accounted for in SWM model preparation (City of Ottawa).
- The product of depth times velocity on streets not to be greater than 0.6 during the 100-year storm (City of Ottawa).
- Major and minor flow to be conveyed to SWM pond 1 for quality (70% TSS Removal) and quantity control (EUC MSS).

5.3 STORMWATER MANAGEMENT DESIGN

The site is to be designed using the “dual drainage” principle, whereby the minor (pipe) system is designed to convey the peak rate of runoff from the 2-year design storm and runoff from larger events is conveyed by both minor (pipe) and major (overland) channels, such as roadways and walkways, safely off site without impacting proposed or existing downstream properties.

In keeping with the 2-year inlet restriction criterion (5-year for collector streets, 10-year for arterial roads), inlet control devices (ICDs) or orifice plates will be specified during the detailed design stage for all street and rear yard catchbasins to limit the inflow to the minor system. Restricted inlet rates to the sewer are necessary to prevent the hydraulic grade line from surcharging storm sewers into basements during major storms.

Drawing STM-1 outlines the proposed storm sewer alignment and drainage divides. The major system flows generated from larger events (beyond the 100yr storm) will be safely conveyed to Belcourt Boulevard via Couloir Road and ultimately SWM Pond 1 by engineered (overland) channels such as roadways and walkways. Details of overland flow routes to SWM pond 1 through further Richcraft and Minto owned lands can be found in the Master Servicing Study (MSS) for EUC Phase 3 Area CDP. Per the requirements noted in the PCSWMM model prepared as part of the Trails Edge East Phase 1 Servicing and Stormwater Management Report (Stantec, 2019), it is intended to convey major system flows to the boundary of Phase 1 lands and provide additional minor system inlets to limit major system spillage to Couloir Road, and to ensure a maximum depth of flow of 0.35m (including static storage depths) as necessary to meet current City of Ottawa SWM criteria.

The minor system from the proposed subdivision will be conveyed and modeled up to the point of discharge to existing stubs on Arete Way and Ascender Avenue (see **Drawing STM-1** for locations). Pond 1 has been designed and sized to permit servicing of the proposed development area per DSEL’s Design Brief for the Reconstruction of the East Urban Community Stormwater Management Pond 1, and verified within the EUC Phase 3 MSS (see **Appendix C**). Per the report, Pond 1 infrastructure is sufficient to service the development in the interim prior to construction of the future Transitway. Mixed Use developments to the north including portions of the future Brian Colburn Boulevard are expected to be serviced through the

Trails Edge East development, along with an anticipated stub drop-off location at the boundary of Street 28 and Brian Coburn. Per the Phase 1 Servicing and Stormwater Management Report, external lands serviced through Trails Edge East are expected to provide sufficient surface storage to contain the 100-year storm event within their respective areas. As the PCSWMM model prepared for Phases 1-3 of the Trailsedge Subdivision does not indicate overland flows to adjacent rights-of-way (Belcourt Boulevard) further downstream, and that the current proposed grading anticipates a similar level of overland storage within road sags to the previous Phases 1-3, it is anticipated that sufficient surface storage will be provided within road sags via catch basin inlet control devices to meet the requirements above and in Section 5.2.

The following table identifies peak outflow rates previously allotted to the two Arete Way and Ascender Avenue (discharging to manhole 1002 and 1004 respectively). A runoff C coefficient of 0.80 was applied during prior model runs which is anticipated to be conservative for the proposed Phase 4 development:

Table 5: Peak Storm Minor System Discharge

MH ID	2yr Discharge (m3/s)	5yr Discharge (m3/s)	100yr Discharge (m3/s)	100yr + 20% Discharge (m3/s)	Sewer Dia. (mm)
STM 1002	0.582	0.830	0.930	0.943	900
STM 1004	5.081	7.250	8.120	8.236	2100
Total	**5.663**	**8.080**	**9.050**	**9.179**	

As demonstrated within the storm design sheet included within **Appendix C**, anticipated AxC values for the development (22.830) do not exceed that previously assumed for capture via Phase 1 storm sewers within the PCSWMM model for the region (24.868). As pipes further downstream (sewers from STM1003 to STM1001) are not demonstrated as being surcharged during the 100yr storm event, downstream infrastructure is assumed to be sufficiently sized for Phase 4 development areas, and hydraulic grade lines will be further assessed during detailed design of the subdivision once proposed building footing elevations are known.

The potential effectiveness of at-source (low impact development ‘LID’) measures in reducing volume of runoff from the proposed development area is limited. The EUC Phase 3 MSS notes that the Mud Creek Cumulative impact study has determined requirement for LIDs in the EUC MUC CDP study area including the following:

- A tree planting program in parkland;
- Using infiltration trenches in backyards of singles and townhomes where feasible;
- Setting right-of-way widths for the majority of local roadways at 18m (not 16.5m) to ensure healthy street trees that will be effective in providing evapotranspiration in post-development conditions.

5.4 DEVIATIONS FROM PREVIOUS STUDIES

The EUC Phase 3 MSS notes that the mid-high density block located adjacent to Fern Casey Boulevard (identified as Blocks 193 and 194 west of the current draft plan) were assumed to have a minor system capture rate associated with the 5-year event, and capture area of 2.28ha. The block was previously resized to have an increased area of approximately 2.60ha, and minor system capture rates have been reduced to

that previously assumed in the Trails Edge East Phase 1 Servicing and Stormwater Management Report of the 2-year event at an identical runoff C of 0.80.

Additionally, location of the trunk storm sewer connection to the mixed-use block to the north of the development has been realigned to suit larger proposed rights-of-way on Street 28 to ease conflicts with local sewers and easement requirements at pathway connections adjacent to proposed unit side yards.

Major overland flow paths have also been realigned to suit the proposed road configuration, and optimize grading with respect to anticipated grade raises across the development. As noted in prior studies, the 100-year major system flow from the development is expected to be minimized to suit assumptions made in development of the detailed PCSWMM model for the downstream Phase 1 areas. Major system spillage from events beyond the 100-year event (climate change event) will be modeled to discharge freely to downstream areas. Resultant depths of flow will be assessed at the detailed design stage to ensure no deleterious effects to downstream systems are noted as a result of such flows.

Development areas for Phase 4 have been adjusted to suit current property boundaries with respect to Brian Coburn, Mer Bleue Road, the adjacent newly constructed roundabout, and development boundaries at the future BRT corridor / Hydro corridor. Portions of the proposed development fronting streets previously constructed during Phases 1-3 which have already been included in previous models have been excluded from the drainage area plan on drawing STM-1.

6.0 GRADING AND DRAINAGE

Phase 4 of the Trailsedge East Subdivision has been cleared of topsoil and deleterious material. Phase 4 of the site is expected to be subjected to a soil preloading program as per previous phases of development. As of the writing of this report, Phase 3 is still undergoing a soil preloading program with surcharge material placed throughout the lot footprints, with excess from the preloading program anticipated to be placed within Phase 4.

Historically, the topography across the site has been relatively flat, generally sloping from northeast to southwest, with a cutoff swale at the southern property boundary providing relief to the existing Trailsedge development phases from external flows progressing overland from the east. As part of the earthworks program for Phase 2-3, a drainage ditch just north of Phase 3 was created to carry flows from east to west. The ditch ultimately outlets into a catch basin just northeast of the Fern Casey Street and Couloir Road intersection.

The objective of the grading design strategy is to satisfy the stormwater management requirements, adhere to permissible grade raise restrictions where possible (**see Section 9**) for the site, and provide for minimum cover requirements for storm and sanitary sewers. The grading design also follows the recommendations outlined in the EUC Phase 3 MSS where possible, and endeavors to provide an overland route at the southern phase boundary to the existing Trailsedge East Phase 1 rights-of-way.

As mixed use lands to the north of Brian Coburn will not be able to discharge overland to the remainder of the Trails Edge development, major system runoff from the 100-year storm event will be required to be retained on site and released slowly to the minor system. An emergency overland flow route will be provided to Brian Coburn / Mer Bleue per requirements outlined in the MSS.

Refer to grading plan **Drawing GP-1** for conceptual grading plans of the development.

7.0 APPROVALS

An Environmental Compliance Approval (ECA) from the Ontario Ministry of Environment, Conservation, and Parks (MECP) will be required for the proposed Phase 4 servicing works related to inlet control devices, storm sewers and sanitary sewers (Transfer of Review). The Rideau Valley Conservation Authority (RVCA) and South Nation Conservation Authority (SNCA) will be circulated on detailed design submissions prior to MECP ECA submission and municipal approval of the subdivision. DFO/RVCA approval has already been given with regards to fish habitat compensation for the Mud Creek headwaters during design of Trailsedge West.

An MECP Permit to Take Water (PTTW) may be required for the development if more than 400,000 L/day of ground or surface water is to be pumped during the construction works. If between 50,000 L/day and 400,000 L/day are expected to be pumped during the construction works, registration on the Environmental Activity and Sector Registry (EASR) are required. The geotechnical consultant shall confirm prior to construction whether a PTTW or EASR registry are required for construction dewatering purposes.

8.0 EROSION CONTROL DURING CONSTRUCTION

In order to protect downstream water quality and prevent sediment build up in catch basins and storm sewers, erosion and sediment control measures must be implemented during construction. The following recommendations will be included in the contract documents and communicated to the Contractor.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit the extent of the exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with geotextiles, geogrid, or synthetic mulches.
6. Provide sediment traps and basins during dewatering works.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Schedule the construction works at times which avoid flooding due to seasonal rains.

The Contractor will also be required to complete inspections and guarantee the proper performance of their erosion and sediment control measures at least after every rainfall. The inspections are to include:

- Verification that water is not flowing under silt barriers.
- Cleaning and changing the sediment traps placed on catch basins.

Refer to **Drawing EC-1** for the proposed location of silt fences, straw bales and other erosion control structures.

9.0 GEOTECHNICAL CONSIDERATIONS AND GRADING

9.1 GEOTECHNICAL INVESTIGATION

A geotechnical existing conditions report for the development was completed by Paterson Group on July 7, 2019, which expanded on the previously prepared geotechnical investigation reports for Eden Park – East Portion – Renaud Road and Trailsedge East – Renaud Road, which were prepared on December 29, 2008 and July 26, 2018 (Paterson Group), respectively. Field testing throughout the subject site of the Trailsedge development was completed in October 2008. Excerpts from the geotechnical existing conditions report are included in **Appendix D**.

The subsurface profile within the Trailsedge East Phase 4 lands consists of a shallow bedrock and deep silty clay deposits. More specifically, the shallow bedrock was found beneath a cultivated organic zone/topsoil overlain by a silty sand, and/or a clayey silt layer within the north portion of the site. The remainder of the subject site was underlain by a sensitive silty clay deposit.

Groundwater levels, determined via piezometers, varied in depths ranging from 0.2 to 6.3m below original ground surface (elevations of 86.8 to 87.62 m) based on monitoring in October 2008. These groundwater levels can be influenced by surface water perched within the borehole backfill material and are subject to seasonal fluctuations.

A 0.5 to 1.5m permissible grade raise restriction (above original ground surface) is recommended within the Trailsedge East Phase 4 development, per the Paterson Group's permissible Grade Raise Plan (Drawing PG3130-7) in Appendix 2 of the Geotechnical – Existing Conditions Report (Paterson Group).

9.1.1 Recommendations for Settlement/Grade Raise

As outlined in the Geotechnical – Existing Conditions Report (Paterson Group, 2019) the development will be subjected to grade restrictions and residential buildings should be design in accordance with Part 4 of the current Ontario Building Code (OBC). Given permissible grade raise restrictions are expected to be exceeded, the geotechnical recommendations are that preloading with or without surcharge, lightweight fill and/or other measures be considered to reduce the risks of total and differential settlement. Additionally, municipal services within the subject site will be completed mostly through OHSA Type 2 and 3 soils.

In instances where the proposed grade exceeds the permitted grade raise recommendations, the following options have been provided by Paterson Group to adequately support proposed building foundations:

- More reinforcement should be considered in the design of the footings and walls of the concrete foundation to mitigate the risk of cracking, and control joints should be considered within the brick work between the garage and basement.
- Lightweight fill can be used to allow grade raises without substantially impacting the load on the underlying soils.
- Preloading and surcharging the proposed site in localized areas to accelerate the consolidation and settlement process.

9.1.2 Recommendations for Groundwater Control

Groundwater infiltration into excavated areas is expected to be low, given site soil properties, and can typically be controlled via open sumps. In instances where perched groundwater conditions produce high temporary groundwater infiltration levels, pumping from open sumps are expected to sufficiently control groundwater inflows into the excavated area. Under circumstances where the pumping flowrate exceeds 50,000 L/day during construction of the development, a temporary MOE permit to take water will be required.

The surficial geology across the site is primarily glaciomarine clay. The infiltration potential on the subject area is considered to be low to moderate due to the low permeability silty clay and shallow bedrock of relatively high competence. As such, the subject area can be considered as non-conducive to stormwater infiltration and recharge per the *Existing Conditions Report: Hydrogeology: East Urban Community MUC CDP* (Paterson Group, October 2, 2014).

9.2 FUNCTIONAL GRADING PLAN

A Conceptual Grading Plan has been prepared for Phase 4 and is detailed on **Drawing GP-1**. As shown on the grading plan, road grades for Phase 4 exceed the permissible grade raise identified in the Geotechnical - Existing Conditions Report, dated July 7, 2019 (Report No. PG3130-2). As specified above, the geotechnical report allows for grade raises between 0.5m and 1.5m depending on the subsurface soil conditions. Since the proposed grading indicates portions of the site above the permissible grade raise, a surcharge program or lightweight fill program will be required, which will be completed under the direction of a Geotechnical Engineer licensed in Ontario.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 POTABLE WATER SERVICING

The proposed piping alignment and sizing is anticipated to be capable of achieving the level of service in the proposed development:

- During peak hour (PKHR) conditions, the Phase 4 proposed watermain network is expected to operate above the minimum pressure objective of 276 kPa (40 psi);
- The proposed system is capable of providing sufficient fire flow while maintaining a residual pressure of 138kPa (20 psi) in all areas based on hydraulic analysis done at the Master Servicing level. A final hydraulic analysis is to be completed at time of detailed design;
- As the Richcraft development proceeds eastwards, additional water transmission and available fire flows may necessitate connection to the 600mm diameter trunk watermain within the HEPC, as determined by detailed hydraulic analysis for the current phase of development.

10.2 WASTEWATER SERVICING

The Trailsedge East subdivision will be serviced by a network of gravity sewers which will direct wastewater flows westerly through the Fern Casey Street sewer, and ultimately to Renaud Road and the Forest Valley Pumping Station. Mixed use lands to the north of Brian Coburn Boulevard will also be conveyed through the subject property as directed in the MSS. The proposed sanitary sewer design for Phase 4 indicates two (2) connection points to the existing sewer network within Trailsedge East Phase 1. The connection points generate a total estimated peak outflow of **41.5L/s**. The preferred cover requirement of 2.5 m for the sanitary sewer system has been satisfied in all locations, and requirements for slope and velocities have been met within the local internal sewers. Downstream sewers have been adequately sized to receive peak sanitary discharge from the proposed subdivision.

10.3 STORMWATER MANAGEMENT

The proposed stormwater management plan is in compliance with the goals specified in the background reports and the 2012 City of Ottawa Sewer Guidelines:

- Inlet control devices are proposed to limit inflow from the site area into the minor system to the 2-year storm event (5-year event for collector roads) based on City of Ottawa IDF curves;
- The storm sewer hydraulic grade line will be maintained at least 0.30 m below the underside of footing in the subdivision and downstream properties during design storm events;
- All dynamic surface water depths are to be less than or equal to 0.35 m during all design storm events up to the 100-year event;
- The downstream SWM Pond 1 has sufficient volume capacity to receive runoff volumes from the proposed site and provide the required water quantity and quality control as outlined in the SWM facility design report submitted by others.
- Mixed use properties north of Brian Coburn Boulevard will be required to provide on-site storage to contain the 100-year event within their respective areas while restricting minor system inflows to the 2-year/5-year design event as appropriate. Major system flow from the climate change event can be accommodated through rights-of-way within Phase 1.

10.4 GRADING

The grading for this site has been designed to allow for an emergency overland flow outlet to downstream rights-of-way as per City standards and to minimize the grade raise per restrictions as recommended by the Geotechnical Investigation by Paterson Group (July 2019).

10.5 APPROVALS/PERMITS

An MECP Environmental Compliance Approval (ECA) is required for the installation of the proposed storm and sanitary sewers within the site under the MECP's transfer of review program. A Permit to Take Water or registration on the EASR may be required for dewatering works during sewer/watermain installation pending confirmation by the geotechnical consultant. The Rideau Valley Conservation Authority and South Nation Conservation Authority will need to be consulted in order to obtain municipal approval for site development. No other approval requirements from other regulatory agencies are anticipated.