

Creekside 2 Subdivision
Richmond, ON
Serviceability Report

Prepared For:

1470424 Ontario Inc.

Prepared By:

Robinson Land Development

Our Project No. 20002
February 2022

TABLE OF CONTENTS

LEGAL NOTIFICATION I

1.0 INTRODUCTION 1

2.0 GUIDELINES, STUDIES AND REPORTS 1

3.0 EXISTING CONDITIONS 2

4.0 DEVELOPMENT PROPOSAL 3

5.0 GRADING DESIGN 3

6.0 WATER SERVICING 4

 6.1 Existing Water Supply 4

 6.2 Proposed Water Servicing 5

 6.3 Water Demands 6

 6.4 Fire Protection 6

 6.5 Water Servicing Conclusion 7

7.0 SANITARY SERVICING 7

 7.1 Existing Sanitary Sewer System 7

 7.2 Design Criteria 8

 7.3 Sanitary Design Flows 8

 7.4 Sanitary Sewer Design 9

 7.5 Sanitary Servicing Conclusion 10

8.0 STORM & STORMWATER MANAGEMENT DESIGN 10

 8.1 Existing Storm Sewer System 10

 8.2 Design Criteria 10

 8.3 Storm Sewer Design (Minor System) 11

 8.4 Inlet Control Devices (ICDs) 11

 8.5 Major System 11

 8.6 Quantity Control - Stormwater Management (SWM) Facility 12

 8.7 Quality Control 13

 8.8 Low Impact Development (LID) 13

 8.9 Hydraulic Grade Line (HGL) Analysis 14

 8.10 Sump Pumps 14

9.0 EROSION AND SEDIMENT CONTROL 15

10.0 CONCLUSIONS 15

LIST OF FIGURES

Figure 1 - Key Plan Following Page 1

Figure 2 - Existing Conditions Page 3

LIST OF TABLES

Table 1 - Stormwater Flow and Storage Summary Page 12

LIST OF APPENDICES

APPENDIX A Excerpts from Cut/Fill Analysis
 Draft Plan of Subdivision (prepared by AOV)
 Excerpts from GEMTEC Geotechnical Report
 Conceptual Grading Plan (DWG. 20002-GRD)

APPENDIX B Excerpts from GEMTEC Water Supply Assessment
 Technical Memorandum (prepared by JLR)
 Communal Well Conceptual Site Plan (prepared by JLR)
 Conceptual Watermain Design (DWG. 20002-WM)
 Watermain Design Sheet
 Excerpts from Stantec Fire Flow Assessment
 FUS Calculations

TABLE OF CONTENTS CONTINUED

	Fire Flow Correspondence with City
APPENDIX C	Excerpts from Stantec MSS Excerpts from Parsons Memo No. 5 Excerpts from DSEL Report <i>Plan and Profile of Sanitary Easement</i> (prepared by DSEL) Sanitary Sewer Design Sheet Conceptual Sanitary Design (DWG. 20002-SAN) Sanitary Pumping Station Conceptual Site Plan (prepared by JLR)
APPENDIX D	Storm Sewer Design Sheet Conceptual Storm Design (DWG. 20002-STM) Preliminary Flow and Storage Calculations

LEGAL NOTIFICATION

This report was prepared by Robinson Land Development for the account of **1470424 Ontario Inc.**

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **Robinson Land Development** accepts no responsibility for damages, if any, suffered by any third party because of decisions made or actions based on this project

1.0 INTRODUCTION

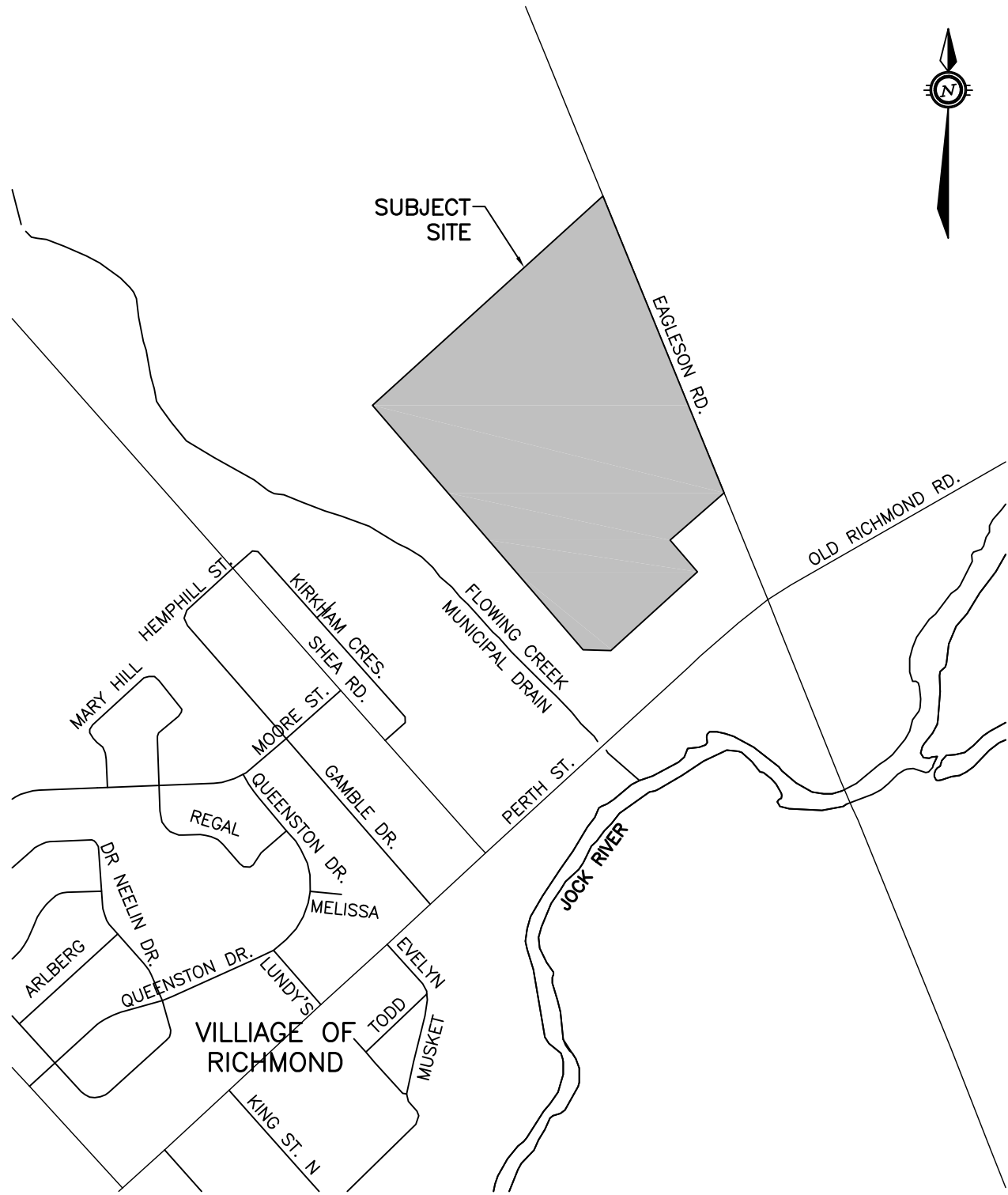
Robinson Land Development have been retained by 1470424 Ontario Inc. to prepare a Serviceability Report to support of the development of the proposed Creekside 2 Subdivision located in the Village of Richmond. The 24.5 hectare subject site is bounded by Eagleson Road to the east, existing commercial properties to the south, Flowing Creek Municipal Drain to the west, and agricultural land to the north (refer to **Figure 1 – Key Plan** following page 1).

This report will provide details to demonstrate that the site can be adequately serviced with municipal infrastructure and can be designed to achieve the required stormwater management controls.

2.0 GUIDELINES, STUDIES AND REPORTS

The servicing and stormwater management designs for the subject site have been prepared in keeping with the following documents:

- **Sewer Design Guidelines**, City of Ottawa, Second Edition, October 2012 (herein referred to as Ottawa Design Guidelines).
 - **Technical Bulletin PIEDTB-2016-01**, City of Ottawa, September 6, 2016.
 - **Technical Bulletin ISTB-2018-01**, City of Ottawa, March 21, 2018.
 - **Technical Bulletin ISTB-2018-03**, City of Ottawa, March 21, 2018.
- **Ottawa Design Guidelines**, Water Distribution, City of Ottawa, First Edition, July 2010 (herein referred to as Ottawa Water Design Guidelines).
 - **Technical Bulletin ISD-2010-2, City of Ottawa, December 15, 2010.**
 - **Technical Bulletin ISDTB-2014-02, City of Ottawa, May 27, 2014.**
 - **Technical Bulletin ISTB-2018-02, City of Ottawa, March 21, 2018.**
- **Design Guidelines for Sewage Works**, Ministry of the Environment, 2008 (herein referred to as MECP Design Guidelines).
- **Stormwater Planning and Design Manual**, Ministry of the Environment, March 2003 (herein referred to as MECP SWM Design Guidelines).
- **Low Impact Development Stormwater Management Planning and Design Guide**, CVC, TRCA, 2010 (herein referred to as LID Design Guidelines).
- **Water Supply for Public Fire Protection**, Fire Underwriters Survey, 1999 (herein referred to as FUS Guidelines).
- **Ontario Building Code Compendium**, Ministry of Municipal Affairs and Housing Building Development Branch, January 1, 2010 (herein referred to as OBC).
- **Village of Richmond Water & Sanitary Master Servicing Study**, Stantec Consulting Ltd., July 22, 2011 (herein referred to as the Stantec MSS).
- **Flowing Creek Catchment Jock River Subwatershed Report 2016**, RVCA, 2016 (herein referred to as the Jock River Subwatershed Report).
- **Design Brief for the Creekside Subdivision Village of Richmond**, David Schaeffer Engineering Ltd., December 2017 (herein referred to as the DSEL Report).



Robinson
Land Development

scale	N.T.S.	CREEKSIDE 2 SUBDIVISION	project no.
date	18/02/2022		2002
drawn by	LR	KEY PLAN	FIG. 1.0

- **Technical Memorandum No. 5 New Gravity Trunk Sewers and Local Pumping Station**, Parsons, August 30, 2019 (herein referred to as the Parsons Memo No. 5).
- **Cut/Fill Analysis Memorandum**, Robinson Land Development, April 3, 2020 (herein referred to as the RLD Cut/Fill Analysis).
- **Cardel Creekside – Flowing Creek: Floodplain Cut Fill Analysis**, J.F. Sabourin and Associates Inc., April 23, 2020 (herein referred to as the JFSA Cut/Fill Analysis).
- **Environmental Impact Statement and Tree Conservation Report**, Muncaster Environmental Planning Inc., April 29, 2020 (herein referred to as the Muncaster Report).
- **Preliminary Geotechnical Investigation**, GEMTEC Consulting Engineers and Scientists Limited, February 5, 2021 (herein referred to as the GEMTEC Geotechnical Report).
- **Village of Richmond Water Supply – Functional Design Study – Fire Flow Requirements**, Stantec Consulting Ltd., September 9, 2021 (herein referred to as the Stantec Fire Flow Study).
- **TW21-1C Water Supply Assessment**, GEMTEC Consulting Engineers and Scientists Limited, December 14, 2021 (herein referred to as the GEMTEC Water Supply Assessment).
- **Agricultural Rehabilitation Plan**, Colville Consulting Inc., November 2, 2021 (herein referred to as the Agrology Report).

3.0 EXISTING CONDITIONS

The subject site is currently zoned Development Reserve Zone (DR1) and is located within the Jock River watershed. The property is currently undeveloped and consists primarily of agricultural fields. Elevations across the property are generally flat; drainage is conveyed west to the Flowing Creek Municipal Drain or east to the roadside ditch on Eagleson Road. The Flowing Creek Municipal Drain flows north-west to south-east along the western boundary of the property before discharging into the Jock River south of Perth Street. Opposite of the Flowing Creek Municipal Drain is the Creekside 1 Subdivision. The 3.8 hectare Creekside 1 Subdivision has received approvals and is reaching full buildout of its 51 single-family residential lots.

A portion of the subject site is constrained by the floodplain of the adjacent Flowing Creek Municipal Drain. A cut/fill analysis was prepared by Robinson Land Development (RLD Cut/Fill Analysis) in conjunction with J.F. Sabourin and Associates Inc. (JFSA Cut/Fill Analysis) in support of the proposed development. The cut/fill analysis was submitted for approval in April 2020 and is currently under review by the Rideau Valley Conservation Authority (RVCA). A cut/fill permit from the RVCA is required to raise the lands subject to development above the 100 year floodplain elevation. In the area of the proposed development, the 100 year floodplain ranges from an elevation of 93.86 metres to an elevation of 94.07 metres, under existing conditions. Following approval and construction of the cut/fill work, the JFSA Cut/Fill Analysis determined that the 100 year floodplain will range from an elevation of 93.87 metres to an elevation of 94.08 metres. Refer to excerpts from the cut/fill analysis provided in **Appendix A**.

Refer to **Figure 2 – Existing Conditions** below for an aerial view of the site in its current development state.

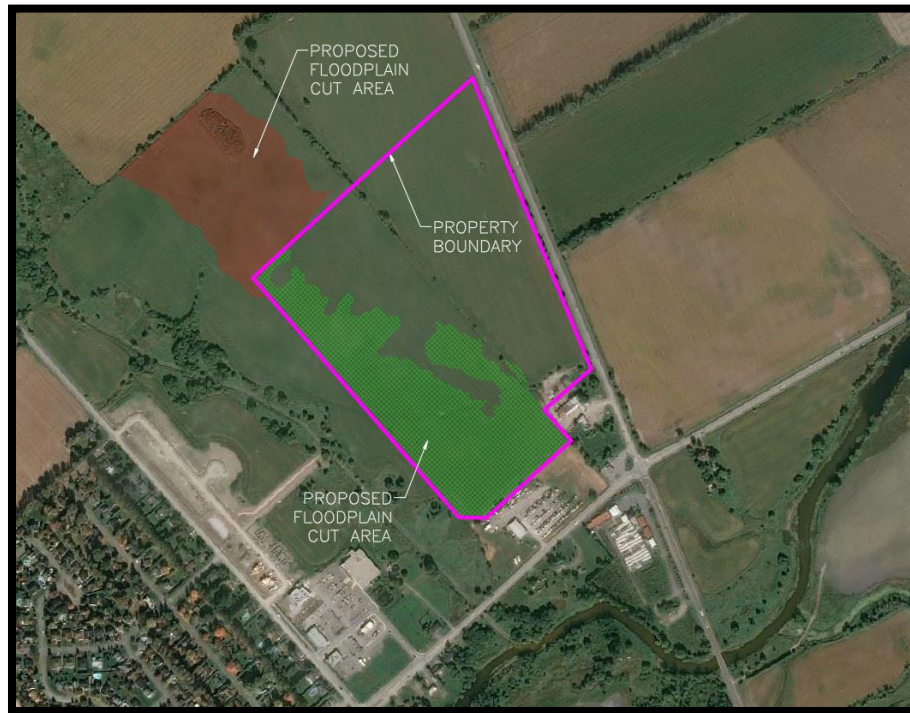


Figure 2 – Existing Conditions

4.0 DEVELOPMENT PROPOSAL

The proposed Creekside 2 Subdivision will incorporate a mix of single family, townhouse and semi-detached residential units. The development will also include a designated park block, a stormwater management (SWM) block, a communal well block, and a wastewater pumping station block. The development will incorporate approximately 3140 metres of municipal roadways with 20 metre right-of-ways. Access to the development will be provided by two new connections to Eagleson Road. The proposed residential units for the Creekside 2 Subdivision will be as follows:

Single Family:	250 units
Townhouse:	130 units
Semi-Detached:	74 units
Total:	454 units

Refer to the Draft Plan of Subdivision, prepared by Annis, O'Sullivan, Vollebekk Ltd. (AOV), in **Appendix A** for more details.

5.0 GRADING DESIGN

The grading for the Creekside 2 Subdivision will be designed to tie into existing elevations along the property boundaries (except for off-site terracing on land by the same Owner) and to minimize cut/fill volumes where possible. Grades within the subject site must be set above the 100 year floodplain of the adjacent Flowing Creek Municipal Drain which ranges from an

elevation of 93.87 metres to 94.08 metres adjacent to the site (following the approved cut-fill work; refer to excerpts from the cut/fill analysis in **Appendix A**).

A geotechnical investigation was prepared by GEMTEC for the subject property (GEMTEC Geotechnical Report). The investigations determined that the development area is underlain by deposits of sensitive silty clay, which has a limited capacity to support loads imposed by grade raise fill material, pavement structures and house foundations. As a result, grade raise restrictions must be implemented for the subject site. The maximum grade raise across the development area will range from 1.0 metre to 3.0 metres above original ground. During detailed design, supplementary investigations will be required to delineate the grade raise restriction zones. Refer to excerpts from the GEMTEC Geotechnical Report in **Appendix A** for more details.

During detailed design, the following grading criteria will be implemented into the on-site design in accordance with current Ottawa Design Guidelines:

- Maximum slope in grassed areas between 2% and 7%.
- Grades above 7% require terracing.
- Maximum terracing of 3H:1V.
- Driveway grades between 2% and 6%.
- Rear terrace grades to be minimum 0.30 metres above swale spillover elevation.
- Front terrace grades to be minimum 0.30 metres above overland spillover elevation.
- Swales (without perforated subdrain) to have minimum slope of 1.5%.
- Swales with less than 1.5% slope to have perforated subdrain.
- Swales shall have minimum depth of 150 mm and maximum depth of 600 mm.

Refer to the Conceptual Grading Plan (DWG. 20002-GRD) provided in **Appendix A** for more details.

6.0 WATER SERVICING

6.1 Existing Water Supply

No municipal watermains are available in close proximity to the subject site in order to provide water supply for domestic use. The majority of the Village of Richmond is serviced by private wells. The subject site is designated as a Public Service Area (PSA) for water and wastewater (Section 2.3.2 of the Official Plan) and therefore any new developments are to be serviced by municipal services (i.e. no private wells). Domestic water supply for the Creekside 1 Subdivision, located west of the Flowing Creek Municipal Drain, is provided by individual drilled wells. However, the Creekside 1 Subdivision was considered under an exception policy due to the minor residential infill nature of the development (i.e. only 51 single-family units).

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) were retained to evaluate the use of a communal well system for the proposed Creekside 2 Subdivision. The results of their study were provided in the *GEMTEC Water Supply Assessment* and included the following key conclusions:

“The water quality available from the test well TW21-1C, completed in the Nepean sandstone aquifer is safe for consumption based on the absence of health-related exceedances; however, groundwater treatment for aesthetic parameters will be required.”

“The water quality of the upper bedrock water supply aquifer (Oxford/March Formations), with the exception of the localized wells in the southern portion of the Creekside 1 development,

meets the ODWQS maximum acceptable concentrations and treatability limits, with aesthetic objective and operational guideline exceedances of colour, total dissolved solids, hardness and the sodium warning level.”

“The quantity groundwater available from the proposed water supply aquifer is sufficient for the proposed development and will sustain repeated pumping at the test rate and duration at 24-hour intervals over the long term.”

“Interference between neighbouring private drinking water wells is expected to be minimal.”

Refer to excerpts from the GEMTEC Water Supply Assessment in **Appendix B**.

6.2 Proposed Water Servicing

The Creekside 2 Subdivision is proposed to be serviced by a new communal well system. The proposed communal well and its appurtenances will be contained within Block 302 of the Draft Plan of Subdivision (provided in **Appendix A**). The communal well block will abut the internal road network (Street No. 4) but will be accessed via a new driveway connection to Eagleson Road as requested by the City during pre-consultation meetings. The communal well design is being prepared by J.L. Richards & Associates (JLR). Refer to the Technical Memorandum and *Communal Well Conceptual Site Plan*, prepared by JLR, in **Appendix B**. The communal well will provide water supply to the proposed watermain network contained within the municipal right-of-ways. The proposed watermain network for the Creekside 2 Subdivision will be designed in accordance with the current Ottawa Water Design Guidelines. Refer to the Conceptual Watermain Design (DWG. 20002-WM) in **Appendix B**.

The *GEMTEC Water Supply Assessment* provided the following recommendations regarding the proposed communal construction and water quality for the Creekside 2 Subdivision:

- *Future production wells should be constructed in accordance with the Drinking Water Facility Design Guidelines and MECP regulations, including, but not limited to, Ontario Reg. 903. The well bore opening should be a minimum of 0.254 metres (10 inches) to reduce well inefficiencies.*
- *Well casings should be extended at least 57.3 metres (188 feet) below ground surface. The entire annular space between the steel casing and the overburden/ bedrock should be filled with a suitable cement or bentonite grout;*
- *A well grouting certification inspection should be conducted during the installation and grouting of the well casing for all future wells installed on the Site. The well grouting certification inspection should be conducted under the supervision of a professional engineer or professional geoscientist.*
- *The future production wells should be located in vicinity of TW21-1C and in accordance with any specific wellhead protection requirements.*
- *It is recommended that a water quality treatment specialist appropriately configure and size the treatment systems.*
- *It is recommended that homeowners and the Local Medical Officer of Health be informed that sodium concentrations exceed 20 mg/L and exceed the warning level for persons on sodium restricted diets.*

Refer to excerpts from the GEMTEC Water Supply Assessment in **Appendix B**.

6.3 Water Demands

Water demands for the Creekside 2 Subdivision have been calculated using the current Ottawa Water Design Guidelines. Based on the proposed unit counts (refer to **Section 4.0**) the following water demands have been estimated for the subject site:

- Average Daily Demand: **4.54 L/s**
- Maximum Daily Demand: **11.35 L/s**
- Peak Hourly Demand: **24.97 L/s**

Refer to the watermain design sheet provided in **Appendix B** for more details.

6.4 Fire Protection

Stantec was retained by the City of Ottawa to prepare a water supply functional design study for the Village of Richmond. As part of the study, the current fire flow limitations in the Village were presented and design criteria was established for future fire flow requirements. The results of the study were provided in the *Stantec Fire Flow Assessment* and recommended that the following fire flow design criteria be used within the Village of Richmond:

- *Fire flow is to be supplied solely from the reservoir storage and from high-lift pumps (HLPs). No storage requirement reduction using the groundwater wells' excess capacity (i.e., offsetting) is to be applied.*
- *For new developments, a fire flow of 13,000 L/min for 2.00 hours; developers would ensure that new unit designs meet the requirements for this fire flow, as per the FUS.*
- *For existing developments' future requirements, a fire flow of 10,000 L/min for 2.00 hours, as per the FUS and as per current development designs (mostly SFH on large lots).*
- *A fire flow of 13,000 L/min for a duration of 2.00 hours should be used to size storage in the Village of Richmond, with provision to expand to 3.00 hours.*

Refer to excerpts from the Stantec Fire Flow Assessment in **Appendix B**.

The total required fire flow for the worst-case scenarios within the proposed Creekside 2 Subdivision have been calculated in accordance with the FUS Guidelines. The FUS calculations have determined that a total required fire flow of 10,000 L/min is appropriate if the following conditions are satisfied:

- Firewalls will be required for all 5-unit townhouses in order to reduce the building footprint area (i.e. firewall would provide 40% reduction in area).
- Firewalls will be required for all 6-unit townhouses in order to reduce the building footprint area below 600 m² (i.e. firewall would provide 50% reduction in area).

Further, City of Ottawa Technical Bulletin ISDTB-2014-02 states that practitioners may cap FUS calculated fire flows to 10,000 L/min under the following conditions:

- For single detached dwellings, provided that there is a minimum spatial separation of 10 m between the backs of adjacent units;
- For traditional side-by-side town and row houses, provided that:
 - Firewalls with a minimum two hour fire-resistance rating that comply with OBC Div. B, Subsection 3.1.10, are constructed to separate a town or row house block into fire areas of no more than the lesser of 7 dwellings, or 600 m² in building area (building footprint); and

- There is a minimum separation of 10 m between the backs of adjacent units (the cap is not applicable to back-to-back townhouses).

Given that the above conditions can be achieved with the implementation of firewalls, the cap 10,000 L/min is applicable for this development. The proposed communal well system (to be designed by JLR) will have the ability to be upgraded to accommodate a fire flow of 13,000 L/min in the future, however, the developer does not intend to propose a denser development which would require a higher fire flow. Refer to the FUS calculations provided in **Appendix B**.

In liaison with the City of Ottawa, it has been acknowledged that a fire flow requirement of 10,000 L/min with the ability to expand to 13,000 L/min in the future, if needed, would be appropriate for this development. Refer to the fire flow correspondence with the City in **Appendix B**.

6.5 Water Servicing Conclusion

It has been demonstrated that a communal well system is feasible to provide water supply for domestic use and fire protection for the proposed Creekside 2 Subdivision and can be designed in accordance with the current Ottawa Water Design Guidelines.

7.0 SANITARY SERVICING

7.1 Existing Sanitary Sewer System

In 2011, Stantec prepared a Master Servicing Study (Stantec MSS) as part of the Class Environmental Assessment for the water and sanitary servicing in the Village of Richmond. The purpose of the Stantec MSS was to provide recommendations for the long-term servicing requirements for existing and future potential development within the entire Village boundary. The boundary of proposed Creekside 2 Subdivision was noted as a future development area and was assumed (once developed) to convey wastewater flows to the existing sewer system on Moore Street, west of Shea Road, before ultimately being conveyed south to the Richmond Pump Station (PS) on Cockburn Street. The Richmond PS discharges to the Glen Cairn Trunk Sewer just south of Hazeldean/Robertson Roads in Kanata through a 500 mm diameter forcemain along Eagleson Road. The Stantec MSS concluded that the existing collection system has sufficient capacity to accommodate existing, infill and future growth potential areas with the exception of nine sewer segments identified as needing upgrades. It should be noted that flows from future development areas (i.e. including the Creekside 2 Subdivision) were estimated using previous City of Ottawa design parameters with higher residential flow values (350 L/person/day compared to 280 L/person/day). Refer to excerpts from the Stantec MSS in **Appendix C** for more details.

In 2017, Parsons was retained by the City of Ottawa to complete a Functional Design Study for wastewater collection system upgrades identified in the Stantec MSS. The study included a total of five technical memorandums. The Parsons Memo No. 5 details the proposed gravity trunk sewers for the undeveloped parcels south of the Jock River and a local pumping station for a parcel in the northeast quadrant of the village (i.e. the proposed Creekside 2 Subdivision). The Parsons study utilized current City of Ottawa design parameters and assumed a population density of 63 persons per hectare for residential use. The Parsons Memo No. 5 provided the following recommendations/assumptions for the North East Development Land:

- *The need for local pumping station has been confirmed, in keeping with the Stantec MSS.*

- *The ultimate arrangement of streets will influence the location of the local sanitary pumping station, forcemain and gravity sewers.*
- *A conceptual location for the pump station has been selected east of Flowing Creek Drain, outside of the regulatory flood limit.*
- *A dual forcemain, per 7.2.1.6.7 of the City of Ottawa Sewer Design Guidelines 2012 and a short segment of sanitary sewer has been indicated discharging to an existing sanitary sewer on Moore Street at the intersection of Shea Road.*
- *The approximate development area includes 24.4 ha of residential use and 1.1 ha of commercial use.*
- *For functional design purposes, a three-meter diameter wet-well with duplex submersible pumps (one duty pump, one standby pump) is assumed.*
- *The total peak sanitary design flow is estimated to be 24.6 L/s. At a nominal flowrate of 25 L/s.*
- *A single 150mm diameter forcemain would have a velocity of 1.3 m/s which is within the desired velocity range for forcemains. The nominal characteristics of each pump is estimated to be 25 L/s at 10 m Total Dynamic Head.*
- *The land is only marginally higher than the regulatory flood level of Flowing Creek Drain. As such, the provision of an emergency gravity overflow, in accordance with Technical Bulletin ISTB-2018-01, does not appear to be feasible if dwellings with traditional basements are desired. This issue will need to be analyzed further as development plans for the parcel are initiated.*
- *The Flowing Creek Drain crossing presents a notable forcemain design issue. A bathymetric survey of the Drain will be required during preliminary design to determine elevations and features. Trenchless techniques should be considered for this crossing.*

Refer to excerpts from the Parsons Memo No. 5 in **Appendix C**.

Wastewater flows from the existing Creekside 1 Subdivision are conveyed by 200 mm diameter sewers to the existing sanitary sewer system on Moore Street in accordance with the Stantec MSS. However, the design of the Creekside 1 sanitary sewer system did not allocate for additional flows from the proposed Creekside 2 lands (see further discussion in **Section 7.4** below). Refer to excerpts from the DSEL Report in **Appendix C**.

7.2 Design Criteria

A new municipal sanitary sewer system will be required to service the subject site. The proposed sanitary sewer system for the Creekside 2 Subdivision has been designed in accordance with the current Ottawa Sewer Guidelines using the following design parameters:

- | | |
|-------------------------------|--|
| • Average Residential Flow: | 280 L/person/day |
| • Peaking Factor: | Harmon's Peaking Factor (Max. 4.0, Min. 2.0) |
| • Harmon Correction Factor: | 0.8 |
| • Infiltration Allowance: | 0.33 L/s/ha |
| • Minimum Full Flow Velocity: | 0.60 m/s |
| • Maximum Full Flow Velocity: | 3.0 m/s |
| • Minimum Sewer Diameter: | 200 mm |
| • Manning's 'n' Value: | 0.013 |
| • Single Family Homes: | 3.4 persons/unit (Table 4.2) |
| • Semi-Detached Units: | 2.7 persons/unit (Table 4.2) |
| • Townhouse Units: | 2.7 persons/unit (Table 4.2) |

7.3 Sanitary Design Flows

Using the design criteria provided in **Section 7.2** above, the peak sanitary design flows for the Creekside 2 Subdivision have been calculated as follows:

Population = (250 units x 3.4 persons/unit) + (204 units x 2.7 persons/unit) = 1400.8 persons

Peak Factor = 3.16 (Harmon Equation)

Peak Population Flow = 3.16 x (280 L/person/day) x (1400.8 persons) / (86400 s/day)
Peak Population Flow = **14.35 L/s**

Extraneous Flow = (24.56 ha) x (0.33 L/s/ha) = **8.10 L/s**

Peak Design Flow = (14.35 L/s) + (8.10 L/s) = **22.45 L/s**

As calculated above, a peak sanitary design flow of 22.45 L/s is expected to be generated from the proposed Creekside 2 Subdivision which is less than the allocated flow 24.6 L/s detailed in the Parsons Memo No. 5. The Parsons Memo No. 5 assumed the northeast lands would include 24.4 hectares of residential use and 1.1 hectares of commercial use; however, the total area tributary to the existing sewer on Moore Street is only 24.56 hectares and is proposed for residential use only. The calculated population of 1400.8 persons is significantly below the population of 1547.3 persons, estimated using the population density (63 persons/ha) from the Parsons study.

7.4 Sanitary Sewer Design

Wastewater flows from the Creekside 2 Subdivision will be conveyed by a new sanitary sewer system to the existing sanitary sewer system on Moore Street, in keeping with the Stantec MSS and Parsons Memo No. 5. The development of the Creekside 1 lands impedes a direct connection to the existing sewer system on Moore Street, and therefore a connection to the existing system within the Creekside 1 Subdivision will be required. Wastewater flows from the Creekside 2 Subdivision will discharge to the existing sanitary manhole (denoted as MH 6A) located on Kirkham Crescent, immediately upstream of the existing sanitary manhole (denoted as EX MH 13C) at the intersection of Moore Street and Shea Road (i.e. designated outlet for the subject site). Since the design of the Creekside 1 Subdivision did not allocate flows from the Creekside 2 development, the existing 200 mm diameter sanitary sewer between Kirkham Crescent and Shea Road does not have capacity (approximately 125 percent full) to convey the additional peak design flow from the Creekside 2 development. In order to support the additional flows, the existing 200 mm diameter sewer segment will need to be upgraded to a 250 mm diameter sewer. Refer to the drawing, *Plan and Profile of Sanitary Easement*, prepared by DSEL for the Creekside 1 Subdivision, in **Appendix C**.

Approximately 3250 metres of new 200 mm diameter gravity sanitary sewers will be required to service the development. The proposed sanitary sewers will be designed to have capacity to convey the peak design flows and meet the acceptable full flow velocity range in accordance with the current Ottawa Sewer Guidelines. Refer to the sanitary sewer design sheets and Conceptual Sanitary Design (DWG. 20002-SAN) provided in **Appendix C** for more details.

Due to the lack of vertical separation between the proposed development area and the existing system, a proposed wastewater pumping station will be required to service the development as noted in the Stantec MSS and Parsons Memo No. 5. The proposed wastewater pumping station is to be designed by JLR and will be located within Block 285 of the Draft Plan of Subdivision (provided in **Appendix A**). The JLR scope of work will also include the design of the sanitary forcemains required to convey wastewater flows from the proposed pumping station, through easement Block 304, under Flowing Creek Municipal Drain, to the existing sanitary sewer in the Creekside 1 Subdivision. Refer to the Sanitary Pumping Station Conceptual Site Plan, prepared by JLR, in **Appendix C** for more details. In accordance with City of Ottawa Technical Bulletin ISTB-2018-01, in regards to proposed wastewater pumping

stations, the hydraulic grade line (HGL) in the upstream sanitary system should be assessed to ensure that the maximum HGL does not touch the underside of footing (USF) of any building. During detailed design, the HGL elevations will need to be compared with the minimum USF elevations, as determined by the grading design, to ensure the design is in keeping with the current Ottawa Sewer Guidelines.

7.5 Sanitary Servicing Conclusion

It has been demonstrated that the proposed Creekside 2 Subdivision can be adequately serviced with a municipal sanitary sewer system with the provision of a proposed wastewater pumping station and sanitary forcemains (to be designed by JLR). The proposed sanitary sewer network, including the gravity sewers, pumping stations and forcemains, can be designed in accordance with the current Ottawa Sewer Guidelines. The peak sanitary design flow from the ultimate development has been calculated to be less than the peak flow allocated in the Parsons study for the northeast development lands.

8.0 STORM & STORMWATER MANAGEMENT DESIGN

8.1 Existing Storm Sewer System

No municipal storm sewers are available in the vicinity of the subject site. Roadside ditches are utilized to convey local drainage along Eagleson Road to the east and Perth Street to the south.

8.2 Design Criteria

A new municipal storm sewer system will be required to service the subject site. The storm sewer system will implement a dual drainage design, consisting of a minor and major system. The proposed storm sewer system for the Creekside 2 Subdivision will be designed in accordance with the current Ottawa Sewer Guidelines using the following design criteria:

Minor System

- Return Frequency Local Roads 2 Year
- Rainfall Intensity City of Ottawa Curve Equations
- Minimum Full Flow Velocity: 0.80 m/s
- Maximum Full Flow Velocity: 3.0 m/s
- Minimum Sewer Diameter: 250 mm
- Manning's 'n' Value: 0.013

Major System

- Return Frequency Local Roads 100 Year
- Maximum Road Sag Ponding Depth 0.35 m
- Maximum Rear Yard Ponding Depth 0.30 m

In order to mitigate impacts to downstream infrastructure and watercourses, stormwater quantity and quality controls will be implemented into the on-site design. In keeping with the design criteria outlined for the adjacent Creekside 1 Subdivision and industry standards, the following stormwater management controls are proposed for the subject site:

Quantity Control

- Control post-development outflows to pre-development levels for the 2 year through 100 year design storm events.

Quality Control

- Provide Enhanced Level (80% TSS removal) quality control of stormwater runoff discharging from the subject site.

The suitability of the stormwater management controls proposed above for the subject site should be assessed by the City of Ottawa and RVCA.

8.3 Storm Sewer Design (Minor System)

New municipal storm sewers (minor system) will be required to service the proposed Creekside 2 Subdivision. Approximately 3317 metres of new storm sewers, ranging from 250 mm to 1500 mm in diameter will be required. The proposed storm sewers will be designed to have capacity to convey the peak 2 year design storm event and to meet the acceptable full flow velocity range in accordance with the current Ottawa Sewer Guidelines. For the purpose of preliminary design calculations, a runoff coefficient of 0.65 has been assumed for the site. During detailed design, weighted runoff coefficients will be calculated for each respective drainage area based on the amount of impervious and pervious areas. The municipal sewer system contained within the internal municipal right-of-ways, will convey stormwater to a proposed SWM facility, contained within Block 283 (refer to the Draft Plan of Subdivision in **Appendix A**). In order to reduce pipe sizes and maximize cover depth within the right-of-ways, two storm inlets to the SWM facility will be provided. The SWM facility will outlet the minor system through a sewer easement contained within Block 303, to the Flowing Creek Municipal Drain, located west of the subject site. Given that a new outlet to Flowing Creek is proposed, a permit from the RVCA under O. Reg. 174/06 will be required. Further, given that Flowing Creek is identified as a municipal drain, the Municipal Drainage Superintendent should be consulted with respect to potential impacts on their jurisdiction and responsibilities. Refer to the storm sewer design sheets and Conceptual Storm Design (DWG. 20002-STM) in **Appendix D**.

8.4 Inlet Control Devices (ICDs)

The use of inlet control devices (ICDs) within the proposed storm sewer system in order to prevent the storm sewers from being surcharged during storm events exceeding the 2 year design storm will be reviewed during detailed design. If required, the ICDs will be installed in the outlet pipes of the proposed catch basin structures and will be appropriately sized based on an allowable flow and available head. As per City of Ottawa Technical Bulletin ISTB-2018-04, ICDs may not be required in dual drainage systems where sump pumps are proposed (refer to **Section 8.10**), however, this will be confirmed at detailed design.

8.5 Major System

A major system overland flow route will be incorporated into the overall stormwater management design for the Creekside 2 Subdivision. The major system overland flow route will utilize the internal municipal right-of-ways to convey the major systems flows to the proposed SWM facility contained within Block 283. Major system flows would ultimately be conveyed to the Flowing Creek Municipal Drain via Block 303, however, the SWM facility will have capacity to contain storm events far exceeding the 100 year design storm before overtopping occurs. Ponding within the municipal road sags will be restricted to a maximum

depth of 0.35 metres in accordance with the current Ottawa Sewer Guidelines. The major system design will ensure that the proposed houses and adjacent properties are protected for all storm events up to and including the 100 year design event.

During detailed design the 100 year and 100 year plus climate change scenarios will be modelled to ensure that the limits of ponding within the municipal right-of-ways does not encroach into the proposed house footprints.

8.6 Quantity Control - Stormwater Management (SWM) Facility

In accordance with the design criteria proposed for the subject site, post-development outflows must be controlled to pre-development levels for the 2 year through 100 year design storm events. Stormwater will be conveyed by the proposed storm sewers (minor system) and road network (major system) to a proposed SWM facility, contained within Block 283. The SWM facility design will incorporate orifice controls in order to restrict the outflows to pre-development levels prior to discharging through Block 303, ultimately to the Flowing Creek Municipal Drain. The SWM facility will be designed to have adequate available storage volume to contain flows (in excess of the allowable pre-development flows) for all storm events up to and including the 100 year design event.

Stormwater runoff from approximately 23.1 hectares of the total 24.5 hectare subject site will be conveyed to the proposed SWM facility. Runoff from a portion of the rear yards (landscape and roof areas only) is assumed to free flow uncontrolled off-site, bypassing the SWM facility. However, the amount of free flow drainage area will need to be reviewed and adjusted as required during detailed design to ensure that the allowable release rate from the subject site is not exceeded for the 2 year through 100 year design events.

For preliminary sizing purposes, it has been assumed that the entire 24.5 hectare drainage area will be conveyed to the proposed SWM facility. The required storage volume within the SWM facility has been estimated for the 2 year through 100 year design storm events using an allowable release rate equal to the pre-development flow for the subject site. A summary of the preliminary stormwater flow and required storage calculations has been provided in **Table 1** below:

Table 1: Stormwater Flow and Storage Summary

Return Period	Pre-Development Flow (L/s)	Post-Development Flow (L/s)	Storage Required (m ³)
2 Year	836.3	2303.5	1760.6
5 Year	1121.9	3110.1	2385.9
100 Year	2379.4	6638.0	5110.3

Notes:

1. Flows have been calculated using the Rational Method ($Q=2.78CiA$).
2. A C value of 0.50 has been assumed for the pre-development drainage area using City of Ottawa Sewer Guidelines Table 5.7 (Clay and silt loam; cultivated; flat slope).
3. A C value of 0.65 has been assumed for the post-development drainage area.
4. 100 Year C values have been increased by 25%.
5. Pre-development flows are based on a time of concentration of 60 minutes estimated using the Uplands Method.

The required storage volumes provided in **Table 1** above have been estimated based on peak flows for the total drainage area, calculated using the Rational Method. During detailed design, a modelling analysis of the minor and major systems will be required to optimize the storage

requirements as the Rational Method is expected to provide overly conservative values. Assuming a pond bottom elevation of 92.25 m and maximum 3H:1V side slopes, a total available storage volume of approximately 5350 m³ can be provided at a ponding elevation of 93.50 m and depth of 1.25 metres. Therefore, the proposed SWM facility can provide adequate available storage volume to contain all storm events up to and including the 100 year design storm. Refer to the preliminary stormwater flow and storage calculations provided in **Appendix D**.

The GEMTEC Water Supply Assessment provided the following recommendation regarding proposed SWM facilities within the subject site:

“Hydrogeological sensitive areas may exist where the clay is absent or it is removed from the surface by excavation. In general, the groundwater chemistry results, an absence of nitrate compounds and bacteriological parameters, also supports the water level data and suggest that the Site is not hydrogeological sensitive. However, consideration should be given to any excavations, such as storm water ponds, that could remove protective clays from the near surface at the Site. In these instances where excavation must be made, protective clay liners or geosynthetic liners should be considered.”

During detailed design, the proposed bottom of the SWM facility elevation with respect to the existing clay layer will need to be reviewed by GEMTEC to determine if a liner is required. Refer to excerpts from the GEMTEC Water Supply Assessment in **Appendix B**.

8.7 Quality Control

As detailed in the Jock River Watershed Report, the surface chemistry water quality of Flowing Creek (adjacent to the subject site) is considered “poor” and has shown persistently elevated nutrient concentrations and E. coli counts as well as high metal concentrations over a 12 year period. Implementation of improved stormwater and agricultural best management practices are recommended to address water quality concerns and retain existing shoreline vegetation. The existing shoreline vegetation of Flowing Creek will remain undisturbed with the exception of a single outlet channel required to convey “treated” stormwater from the Creekside 2 Subdivision to Flowing Creek at controlled rates (i.e. pre-development levels). The development area for the Creekside 2 Subdivision will be located a minimum of 100 metres from the banks of Flowing Creek which far exceeds the minimum 30 metre development setback for water quality and shoreline protection.

In accordance with the design criteria proposed for the subject site, Enhanced Level (80% TSS removal) quality control must be provided for stormwater discharging from the subject site. Enhanced Level quality control will be provided by two oil-grit separator (OGS) units installed inline with the proposed storm sewer system (minor system). An OGS unit will be required immediately upstream from each inlet to the proposed SWM facility. During detailed design, the OGS units will be appropriately sized to provide a minimum of 80% TSS removal based on site specific parameters for the tributary drainage areas. Areas of the site which are considered ‘clean’ (i.e. landscaped areas and roofs) are not required to receive quality control. However, these areas will receive a degree of quality cleansing via filtration, infiltration and sediment capture within the grassed swales and surface vegetation.

8.8 Low Impact Development (LID)

During detailed design, the feasibility to implement Low Impact Development (LID) measures into the on-site drainage design will be reviewed. The following LID measures may be implemented to further reduce the transport of sediments and promote on-site groundwater recharge:

- Disturbed areas within the development area will be re-vegetated as soon as possible.
- Discharge roof downspouts to pervious areas for natural infiltration and evaporation.
- Sump pumps (if required) will also be directed to pervious areas.
- Perforated subdrain systems in rear yards will promote filtration, infiltration and evaporation of stormwater runoff.
- Lot line drainage swales and overland sheet flow will provide a degree of quality cleansing via filtration, infiltration and sediment capture within the grassed swales and surface vegetation.

The hydraulic conductivity of the native underlying soils (i.e. clay) and the seasonally high groundwater level may influence the effectiveness of LID measures and will be reviewed during detailed design.

8.9 Hydraulic Grade Line (HGL) Analysis

Due to grading constraints, the outlet from the proposed SWM facility cannot be located above the 100 year floodplain elevation of the adjacent Flowing Creek Municipal Drain. The invert of the outlet pipe (EL = 92.12 m) will be located above the 2 year ponding elevation (EL = 92.06 m). However, the outlet pipe will be partially submerged during the 5 year (EL = 92.42 m) through 20 year (EL = 92.95 m) design events and fully submerged during the 50 year (EL = 93.62 m) and 100 year (EL = 93.95 m) design events (refer to data from river STA 552 in the JFSA Cut-Fill Analysis in **Appendix A**). Since the outlet is expected to be submerged, a HGL analysis for the proposed storm sewer system will be required to ensure that the design is in accordance with current Ottawa Sewer Guidelines, specifically ISTB-2018-04. The 100 year HGL within the on-site storm sewer system will be assessed using an assumed downstream tailwater elevation of 93.95 metres (i.e. approximate 100 year water level of Flowing Creek Municipal Drain adjacent to the proposed outlet; river STA 552). The HGL will also need to be assessed based on the 100 year ponding elevation within the SWM facility if determined to be greater than the water levels of the adjacent Flowing Creek Municipal Drain. During detailed design the HGL will be assessed using a dynamic model since a static model may be overly conservative. Similar to the adjacent Creekside 1 design, the majority of the Creekside 2 Subdivision is expected to experience a surcharged storm sewer system (i.e. HGL above storm sewer obvert) during the 100 year design event, however, the 100 year HGL must be contained below the surface elevations in accordance with ISTB-2018-04.

8.10 Sump Pumps

The installation of sump pumps for the purpose of foundation drainage may be required for some of the lots within the proposed Creekside 2 Subdivision for the following reasons:

- The minimum separation requirement (0.30 metres) between the 100 year HGL (refer to **Section 8.9**) and the USF cannot be achieved due to the submerged outlet as a result of the water level of the adjacent Flowing Creek Municipal Drain.
- The subject site is underlain by clay soils and has a grade raise restriction (refer to **Section 5.0**) which limits the ability to fill the site to achieve a gravity sewer connection at all locations.
- The lack of vertical separation between the elevation of storm sewer outlet and the elevation of the proposed road connections to Eagleson Road also limits the ability to achieve a gravity sewer connection at all locations.

During detailed design, the implementation of sump pumps will be provided in accordance with the current Ottawa Sewer Guidelines, specifically ISTB-2018-04.

9.0 EROSION AND SEDIMENT CONTROL

In order to protect downstream infrastructure and watercourses, erosion and sediment control measures must be implemented prior to construction and maintained until vegetation has been re-established in disturbed areas. The following erosion and sediment control (ESC) measures have been proposed for the subject site:

- Limiting the extent of exposed soils at any given time.
- Erosion and sediment control measures shall be maintained until vegetation has been re-established in all disturbed areas. Re-vegetate disturbed areas in accordance with approved Landscape Plan as soon as possible.
- Stockpile soil away (15 metres or greater) from watercourses, drainage features and top of steep slopes.
- Installation of silt sacks between frame and cover on all proposed and existing catch basins and open cover storm manholes until construction is completed.
- Silt fence and straw bales to be installed and maintained along the property boundaries where indicated.
- Install mud mats at all construction entrances.
- During active construction periods, visual inspections shall be undertaken on a weekly basis and after major storm events (>25mm of rain in 24 hour period) on ESC and any damage repaired immediately.
- ESC shall also be assessed (and repaired as required) following significant snowmelt events.
- Visual inspections shall also be undertaken in anticipation of large storm events (or a series of rainfall and/or snowmelt days) that could potentially yield significant runoff volumes.
- Care shall be taken to prevent damage to ESC during construction operations.
- In some cases, barriers may be removed temporarily to accommodate construction operations. The affected barriers shall be reinstated immediately after construction operations are completed.
- ESC should be adjusted during construction to adapt to site features as the site becomes developed.
- ESC shall be cleaned of accumulated sedimentation as required and replaced as necessary.
- During the course of construction, if the Engineer believes that additional prevention methods are required to control erosion and sedimentation, the Contractor shall implement additional measures, as required, to the satisfaction of the Engineer.
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) 805.

Detailed erosion and sediment control plans, which indicate the implementation of the above measures, will be prepared during detailed design.

10.0 CONCLUSIONS

It has been demonstrated that the proposed Creekside 2 Subdivision, located in the Village of Richmond, can be adequately serviced with municipal infrastructure and can be designed to meet the stormwater management requirements for the subject site. The proposed servicing and stormwater management designs will be achieved by implementing the following key features:

- Water supply for domestic use and fire protection will be provided by a communal well and municipal watermains.

- Wastewater flows will be conveyed to the existing sanitary system on Moore Street via new municipal gravity sanitary sewers, a wastewater pumping station and sanitary forcemains.
- Stormwater will be collected and conveyed by a new municipal storm sewer system.
- A new SWM facility will provide post-to-pre quantity control and quantity storage volume.
- Enhanced Level (80% TSS removal) quality control will be provided by two inline OGS units.
- Implementation of LID measures to promote groundwater recharge (where possible to do so).
- Erosion and sediment controls will be implemented prior to construction and maintained until vegetation has been re-established in disturbed areas.

Prepared By:

Reviewed By:



Brandon MacKechnie, P.Eng.
Project Engineer



Angela Jonkman, P.Eng.
Manager – Land Development & Drainage
Services

Appendix A

Excerpts from Cut/Fill Analysis

Draft Plan of Subdivision
(Prepared by AOV)

Excerpts from GEMTEC
Geotechnical Report

Conceptual Grading Plan
(DWG. 20002-GRD)

Appendix B

Excerpts from GEMTEC Water
Supply Assessment

Technical Memorandum (Prepared
by JLR)

Communal Well Conceptual Site
Plan (Prepared by JLR)

Conceptual Watermain Design
(DWG. 20002-WM)

Watermain Design Sheet

Excerpts from Stantec
Fire Flow Assessment

FUS Calculations

Fire Flow Correspondence with City

Appendix C

Excerpts from Stantec MSS

Excerpts from Parsons Memo No. 5

Excerpts from DSEL Report

*Plan and Profile of Sanitary
Easement* (Prepared by DSEL)

Sanitary Sewer Design Sheet

Conceptual Sanitary Design
(DWG. 20002-SAN)

Sanitary Pumping Station
Conceptual Site Plan (prepared by
JLR)

Appendix D

Storm Sewer Design Sheet

Conceptual Storm Design
(DWG. 20002-STM)

Preliminary Flow and Storage
Calculations