MASTER SERVICING STUDY

FOR

EAST URBAN COMMUNITY PHASE 3 AREA COMMUNITY DESIGN PLAN

RICHCRAFT HOMES

CITY OF OTTAWA

PROJECT NO.: 14-733

OCTOBER 2019
2ND SUBMISSION

MASTER SERVICING STUDY
for
EAST URBAN COMMUNITY PHASE 3 AREA COMMUNITY DESIGN PLAN

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REFERENCED DOCUMENTS FOR EUC PHASE 3 AREA COMMUNITY DESIGN PLAN

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1. **Community Design Plan (Fotenn, October 2019)**
2. **Master Transportation Study (Castleglenn, May 2019)**
3. **Existing Conditions Reports (Various, 2015)**
4. **Consultation Report (Morrison Hershfield, November 2018)**

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1.0 INTRODUCTION

This Master Servicing Study (MSS) addresses the provision of community-wide servicing infrastructure to support the proposed development of the East Urban Community (EUC) Phase 3 Area Community Design Plan (CDP) area in the City of Ottawa.

The EUC Phase 3 Area CDP study area is approximately 220 hectares and is located in the east end of the City of Ottawa. The study area is generally bound by Pagé Road to the west, Innes Road to the north, Tenth Line Road to the east and Renaud Road to the south. A Hydro One corridor traverses the study area. The study area boundaries are shown in ***Exhibit 1***, and further depicted in ***Drawing 1,*** enclosed with this report.

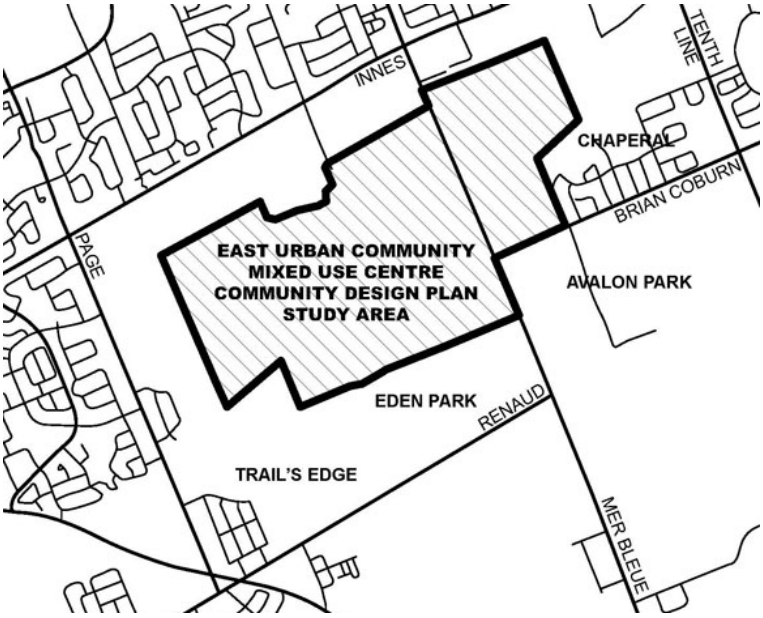

Exhibit 1: EUC Phase 3 Area CDP Study Area

As identified in ***Drawing 1***, the EUC Phase 3 CDP area has been divided into four quadrants for the purposes of this MSS. The study area boundaries are indicated on ***Drawing 1***, with Mer Bleue Road and the Hydro Corridor serving as the quadrant limits.

The proposed future development activities within the EUC Phase 3 CDP area require approvals under the *Planning Act* as supporting information for an Official Plan Amendment application. Components of the development activities are also subject to the *Environmental Assessment Act*. Specifically, the proposed future development activities include the following land uses:

- Low Density Residential;
- Medium Density Residential;
- Medium-High Density Residential;
- Commercial;
- Mixed-Use;
- Employment;
- Institutional;
- Park;
- Stormwater Management Facility;
- Rock Barren, Associated Buffer, and Setback;
- Hydro Easement/Open Space; and,
- Roads and Multiuse Pathways.

The existing Innes Park Woods adjacent to the study area and existing snow disposal facility within the study area are proposed to be maintained.

A coordinated Planning and Environmental Assessment approach has been adopted, leading to the creation of two concurrent Municipal Class Environmental Assessment documents - a Master Transportation Study (MTS) and a Master Servicing Plan (Master Servicing Study, MSS). These studies support the proposed Official Plan Amendment, which is based on the Community Design Plan (CDP, Fotenn, October 2019) created for the area. This MSS has been prepared in accordance with the Municipal Engineers Association's *Municipal Class Environmental Assessment* (October 2000, as amended in 2007, 2011 & 2015).

Richcraft Homes, on behalf of the EUC Phase 3 Area CDP landowners, has retained **David Schaeffer Engineering Ltd.** to complete this Master Servicing Study, which includes: environmental assessment input provided by **Morrison Hershfield**, stormwater management analysis provided by **J.F. Sabourin and Associates Inc.**: watermain analysis provided by **GeoAdvice Engineering Inc.**, geotechnical and hydrogeological investigations completed by **Paterson Group Inc.**, hydrogeological investigations and water budget analysis completed by **Palmer Environmental Consulting Group Inc.,** natural environment investigations completed by **Niblett Environmental Associates Inc.,** and natural environment and

geotechnical investigations around an existing stormwater facility adjacent to the CDP study area by **Kilgour & Associates Ltd.** and **Golder Associates Ltd.**, respectively.

The objective of this MSS report is to provide technical details of the proposed servicing plan for the northwest quadrant of the EUC Phase 3 CDP area, specifically detailing the proposed water supply servicing strategy, wastewater servicing strategy, stormwater servicing strategy, grading strategy and utility service strategy. Due to the ongoing planning applications in the other three quadrants and their inclusion in other approved MSS reports, the objective of this MSS report is to review the previously approved water supply servicing strategy, wastewater servicing strategy, stormwater servicing strategy, grading strategy and utility service strategy for these areas in the context of the new land uses proposed as part of the CDP (Fotenn, October 2019). This MSS also considers the serviceability of certain neighbouring lands to ensure these lands will be serviceable in the future, or are able to maintain their current servicing strategy. This MSS uses environmental assessment planning principles to evaluate alternative servicing solutions and alternative servicing designs for the EUC Phase 3 CDP area, leading to the identification of a preferred servicing strategy complete with mitigation of potential adverse environmental effects.

1.1 Report Integration

In support of the Official Plan Amendment application for the EUC Phase 3 Area CDP study area, various studies and plans are required to identify: on-site and off-site municipal infrastructure (e.g. roads, water, and sewers); the natural heritage system; recreational pathways; community facility requirements; on-site and off-site transportation infrastructure; and land use densities and mixes. In addition to the various plans and studies, the requirements of the *Municipal Class Environmental Assessment* (Municipal Engineer's Association, October 2000, as amended in 2007, 2011 & 2015) (MCEA) must also be met, where required.

As noted in ***Section 1.0***, as part of the integrated approach to fulfilling requirements under the *Environmental Assessment Act* and *Planning Act*, a Community Design Plan, Official Plan Amendment, and two concurrent Class Environmental Assessment studies were initiated:

- A Master Transportation Study to define the road and transit networks to support the proposed development; and
- This Master Servicing Study to define the water, storm, and sanitary services to support the proposed development.

The reports and planning for the EUC Phase 3 CDP area were undertaken in a similar time frame and in an integrated manner, resulting in an iterative planning and decision making process. An inventory of the concurrent and inter-related reports is provided in ***Table 1***, below, highlighting how the various components influence this MSS. These reports are referenced throughout the MSS and are provided for reference in the appendices or as companion documents under separate cover.

Examples of inter-related aspects of the infrastructure and land use planning process include:

- Analysis of existing conditions, which led to the identification of development constraints (***Exhibit 2***) that were used as the starting point for the Land Use/Demonstration Plan;

- The establishment of trunk watermains, storm collector sewers and sanitary collector sewers along proposed major roads, which is meant to support orderly and cost effective phasing within the EUC Phase 3 CDP area; and,
- The design of the pathways system was developed to reflect environmental amenities, transportation networks, and neighbourhood requirements.

In addition to the reports noted in ***Table 1***, the City of Ottawa is currently undertaking an erosion assessment of Mud Creek, which is a natural watercourse located outside the boundaries of the CDP, but connected to the EUC Phase 3 CDP in that the existing EUC Pond 1 stormwater management facility outlets to this watercourse. EUC Pond 1 is located adjacent to the EUC Phase 3 CDP area and was designed to treat stormwater runoff from part of the CDP area. The study is ongoing and has no formal status, however the CDP project team has shared relevant information with the City of Ottawa throughout the development of this MSS in order to inform the Mud Creek project.

Table 1: Summary of EUC Phase 3 Area CDP Studies/Reports

Report	Relationship to Master Servicing Study
EUC Phase 3 Area CDP (Fotenn) dated October 2019	Delineates the study area and explains the development context. Provides spatial information on land uses, development densities, and projected populations to be serviced.
Public Consultation Report (Morrison Hershfield) dated November 2018	Provides information regarding the integrated *Environmental Assessment* and *Planning Act* process and public consultation.
Existing Conditions Summary (Fotenn) dated August 2014	Identifies the opportunities and constraints for future development within the EUC Phase 3 Area CDP based on the preliminary findings of planning, servicing, natural environment, geotechnical, market, and transportation analyses.
Servicing Infrastructure Existing Conditions (DSEL) dated October 2014	Identifies the existing municipal infrastructure within the EUC Phase 3 Area CDP and assesses its capacity to service the study area.
Transportation Existing Conditions (Castleglenn) dated October 2014	Identifies transportation and traffic goals within the EUC Phase 3 Area CDP and identify current transportation and traffic patterns.
Environmental Existing Conditions (Niblett) dated February 12, 2015	Delineates the natural heritage system within EUC Phase 3 Area CDP. Defines watercourses in the subject lands and adjacent to the subject lands, which influences stormwater management recommendations for the development.
Archaeological Existing Conditions (Golder) dated October 15, 2014	Delineates the presence of archaeological resources in the area that may be affected by the proposed development.
Geotechnical Existing Conditions (Paterson) dated July 7, 2019 & Slope Stability Assessment Reaches 7 and 12 SWM Pond Block (Golder) dated June 2019.	Determines development setback requirements, provides grade-raise recommendations, and provides bedrock contours.
Hydrogeology Existing Conditions (Paterson) dated October 2, 2014	Assesses groundwater discharge, provides recommendations for bedrock excavation, and assesses groundwater recharge.

Hydrogeology Supplemental Information (Palmer) dated December 19, 2014	Further assesses groundwater discharge, provides recommendations for bedrock excavation, and assesses groundwater recharge.
Infiltration and Percolation Test Results (JFSA) dated February 1, 2018	Provides characterization of the rate of at which water enters the ground surface, and the rate of water movement beneath the ground surface.
Headwater Drainage Feature Assessment Summary (Niblett) dated March 28, 2018 and Environmental Impact Statement for SWM Pond Expansion in East Urban Community Mixed Use Centre (Kilgour) dated Sept 5, 2018 and Significant Woodland Definition (Kilgour) dated June 2019.	Provides evaluation, classification and management recommendations for existing watercourses on site, which influences the development concept plan and stormwater management concept for the development. Details mitigation measures required to support proposed pond expansion.

1.2 Master Servicing Study Scope

Generally, this Master Servicing Study (MSS):

- Identifies the need for municipal servicing for development within the EUC Phase 3 Area CDP study area;
- Provides an inventory of existing environmental conditions and background studies/reports;
- Identifies and systematically evaluates alternative servicing solutions, considering environmental, social, transportation, infrastructure and economic effects;
- Summarizes how the preferred servicing solution was applied to various potential Land Use Plans, assessing the benefits and challenges in servicing the different land-use and transportation concepts (details provided in the Public Consultation Report (Morrison Hershfield, November 2018));
- Presents detailed estimates of future servicing needs based on the preferred Land Use Plan;
- Assesses the existing water, sanitary, and storm sewer infrastructure nearby the study area, with respect to alignment issues and capacity to accommodate future development needs;
- Evaluates detailed design alternatives for the Northwest quadrant with respect to grading, stormwater management, and the provision of trunk water, wastewater, and storm drainage infrastructure;
- Reviews the adequacy of previously approved strategies to the Northeast, Southwest, and Southeast quadrants, with respect to grading, stormwater management, and the provision of trunk water, wastewater, and storm drainage infrastructure;
- Identifies the anticipated environmental impacts of the proposed preferred servicing scheme, and identifies required mitigation measures;
- Identifies utility requirements for the community; and

- Identifies the location of the recommended trunk water, wastewater, and stormwater management infrastructure required to service the neighbourhood.

The Terms of Reference for the MSS, which were developed with input from the City of Ottawa, are appended in ***Appendix A***.

2.0 STUDY PROCESS

2.1 Co-ordinated Process with Planning Act and Environmental Assessment Act

Ontario Regulation 345/93 of the Environmental Assessment Act, 1990, designates private sector developers as subject to the requirements of the EA Act if a private sector developer is proposing:

- An undertaking of a type listed in Schedule C of the Municipal Class Environmental Assessment (October 2000, as amended 2007, 2011 & 2015); and,
- The undertaking involves the provision of roads, water or wastewater facilities for the residents of a municipality.

Schedule C projects are projects that have the potential for significant environmental effects; for example, the construction of new water or wastewater facilities and major expansions. Please refer to ***Section 13.1*** for the detailed project listing.

Morrison Hershfield has indicated that the CDP process will comprise of a coordinated Planning and Municipal Class EA, and therefore all supporting studies have been prepared in accordance with the requirements of the Class EA process. The integrated process allows proponents to coordinate the approvals, reviews, and public consultations of both the *EA Act* and the *Planning Act,* to ensure that the requirements of both are met.

2.2 MCEA Master Plan Process

The MCEA process recognizes the benefits of coordinating efforts under the *Class EA* and the *Planning Act*. Master Plans are defined in the Class EA as “long range plans which integrate infrastructure requirements for existing and future land use with environmental assessment planning principles”. Master Plans allow for an integrated process with other planning initiatives and provide streamlining opportunities for projects which have some common elements such as geography or function. There are four (4) approaches that Master Plans can follow to accomplish the various phases of the Class EA process. This MSS has followed Approach 4: Integrated under the Planning Act and was undertaken concurrently with the Community Design Plan to reflect interdependent decisions to benefit the overall community.

As indicated in ***Section 1.0,*** two Master Planning studies were initiated part of this CDP: a Master Transportation Study (MTS) and a Master Servicing Study (MSS). These reports have been prepared in conjunction with the Community Design Plan (CDP) for lands within the study area. Any appeals related to this MSS are to be directed to MECP.

The required Class EA environmental planning tasks generally include:

- Project need and opportunities;
- Existing conditions;
- Consultation with stakeholders;

- Evaluation of alternatives;
- Identification of effects and mitigation; and,
- Documentation and completion of planning documents.

This report presents the methodology, findings and conclusions of the MSS for the East Urban Community: Community Design Plan.

2.3 List of Relevant Background Studies

While largely undeveloped under existing conditions ***(Section 4.6),*** the EUC Phase 3 CDP area has been contemplated for urban development since at least the 1990's. As such, much of the adjacent infrastructure has been sized with consideration for urban development of the area. Beyond the reports listed in ***Table 1***, the following reports are key sources of information that have guided the design of the grading and services for the EUC Phase 3 CDP area:

- East Urban Community Sanitary and Storm Drainage Master Plan Update (Gore & Storrie, 1990);
- East Urban Community Master Drainage Plan (Gore & Storrie, 1992);
- Master Drainage Plan, City of Cumberland East Urban Community Expansion Area (McNeely Engineering Consultants Ltd., 1992);
- East Urban Community Master Drainage Plan Addendum (Stantec, 2000);
- Orléans South Business Campus Development Plan Report (Stantec, 2002);
- Orléans Industrial Park Land Use & Design Study (City of Ottawa, 2003);
- Forest Valley Trunk and Orléans Collector Capacity Analysis (Stantec, October 2003);
- East Urban Community – Community Design Plan (CDP) for the Phase 1 Area (City of Ottawa, 2005);
- Gloucester East Urban Community (EUC) Infrastructure Servicing Study Update, (Stantec, March 2005);
- Tenth Line Pump Station and Dual Forcemains Preliminary Design Report and Emergency Overflow Memo (Stantec, June 27, 2005);
- First Innes Shopping Centres, Stormwater Management Report - Phase 3 Update (Stantec Feb 2006);
- Innes Snow Disposal Facility Meltwater Management Report (Stantec, March 2006);
- Mer Bleue Community Design Plan, Infrastructure Servicing Study (IBI Group, April 2006);
- Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006) (MSU);
- East Urban Community Pond No. 1 Design Brief (Stantec, 2008);

- Trinity Development – Innes/Belcourt Stormwater Management System (IBI Group, January 2009);
- Pharand Lands, Innes Shopping Centres Limited, Serviceability Study (Stantec, Feb 2012)
- Avalon West (Neighbourhood 5), Western Trunk Storm Sewer and Interim Stormwater Management Report, Revision 2 (IBI Group, February 2012);
- Avalon West (Neighbourhood 5), Stormwater Management Facility Design, Revision 2 (IBI Group, October 2012);
- East Urban Community Design Plans for the Phase 1 and Phase 2 Areas (City of Ottawa, October 23, 2013);
- Taggart Group of Companies Infrastructure Servicing Brief (Exp., November 20, 2013);
- East Urban Community Stormwater Management Pond 1 for Trails Edge Subdivision (DSEL/JFSA, March 2014);
- Bilberry Creek Geomorphic Systems Master Implementation Plan (GHD, May 2014);
- Design Brief – Minto Trailsedge Phase II (IBI Group, May 2015);
- Design Brief for the Trails Edge West Richcraft Group of Companies (DSEL, January 26, 2015);
- Mer Bleue Expansion Area Community Design Plan (City of Ottawa, June 2017);
- Servicing Report for Trails Edge and Orléans Business Park (DSEL, July 2017);
- Headwater Drainage Feature Assessment, 3490 Innes Road Development (Kilgour & Associates, July 27, 2017);
- Trails Edge East – Functional Servicing Report (Stantec, August 11, 2017);
- Mer Bleue Urban Expansion Area Secondary Plan (City of Ottawa, August 17, 2017);
- Servicing Options Report for Blacksheep Developments, 2159 Mer Bleue Road (DSEL, December 2017);
- Mer Bleue Urban Expansion Area 10 Master Servicing Study (IBI Group, December 2017);
- Orléans Family Health Hub Stormwater Management & Servicing Report (Exp., April 5, 2018);
- Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision (Stantec, April 12, 2018);
- Design Brief for Caivan (Orléans Village) Limited – 3490 Innes Road (DSEL, May 2018);
- Trails Edge East Phase 1 Servicing and Stormwater Management Report (Stantec, August 2018);
- Trails Edge East Phase 1 Servicing and Stormwater Management Report (Stantec, September 28, 2018);
- Orléans Family Health Hub Stormwater Management & Servicing Report (EXP, Nov 2, 2018);
- Servicing Report for 2159 Mer Bleue Road – Blacksheep Developments (DSEL, December 2018);

- Orléans Family Health Hub Design Drawings (EXP, June 13, 2019); and,
- 4200 Innes Road - Sélection Retraite Orleans Site Plan Control Servicing Report & Drawings (March 25, 2019).

2.4 List of Relevant Guidelines

The following guidelines were utilized in the preparation of this Master Servicing Study:

- Ottawa Sewer Design Guidelines (City of Ottawa, October 2012) (City Standards);
- Technical Bulletin ISDTB-2014-01, Revisions to Ottawa Design Guidelines – Sewer (City of Ottawa, February 5, 2014);
- Technical Bulletin PIEDTB-2016-01, Revisions to Ottawa Design Guidelines – Sewer (City of Ottawa, September 6, 2016);
- Technical Bulletin ISTB-2018-01, Revisions to Ottawa Design Guidelines – Sewer (City of Ottawa, March 21, 2018);
- Technical Bulletin ISTB-2018-04, Revisions to Ottawa Design Guidelines – Sewer (City of Ottawa, June 27, 2018);
- Technical Bulletin ISTB-2019-02, Revisions to Ottawa Design Guidelines – Sewer (City of Ottawa, July 8, 2019)
- Ottawa Design Guidelines – Water Distribution (City of Ottawa, July 2010) (Water Supply Guidelines);
- Technical Bulletin ISD-2010-02 (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);
- Stormwater Planning and Design Manual (Ontario Ministry of the Environment, March 2003) (SWMP Design Manual);
- Interpretation Bulletin, Expectations Re: Stormwater Management (Ontario Ministry of Environment and Climate Change, February 2015);
- City of Ottawa Official Plan (City of Ottawa, originally adopted by Council 2003, and amended from time to time) (Official Plan);
- Infrastructure Master Plan (City of Ottawa, November 2013);
- Design Guidelines for Sewage Works (Ontario Ministry of the Environment, 2008) (MECP Guidelines);
- Fire Underwriters Survey, 1999 (FUS); and
- Ontario Building Code Compendium (Ministry of Municipal Affairs and Housing Building Development Branch, 2012, as amended from time to time) (OBC).

3.0 CONSULTATION

Consultation is an integral part of both the *Planning Act* and the *Municipal Class Environmental Assessment* (MCEA) processes. A *Public Consultation Report* (Morrison Hershfield, November 2018) has been prepared outlining the process that was followed, and includes meeting materials. Information is also available on the City of Ottawa Website (https://ottawa.ca/en/city-hall/public-engagement/projects/east-urban-community-mixed-use-centre-community-design-plan#overview).

Consultation and the exchange of information was undertaken throughout the planning and assessment processes using a variety of methods including: meetings with the general public; regular meetings with the Study Team; and consultation with approval agencies and the Ward Councilor.

The project proceeded under the direction of the City of Ottawa and benefitted from the direct involvement and guidance of a Technical Advisory Committee (TAC), consisting of representatives from select government agencies, approval bodies, and landowners.

Key project issues are summarized in ***Table 2***.

Table 2: Summary of Consultation Comments (Morisson Hershfield, Nov 2018)

Topic	Comment
Transportation	• Concern that dead-ending both Renaud and Pagé Roads at Navan Road would eliminate direct access from Bradley Estates to the Mixed Use Centre and existing retail along Innes Road. • Request for the Brian Coburn extension to continue west of Navan Road and connect to Bradley Estates rather than to the Blackburn Hamlet Bypass. • Request for a safe and convenient pedestrian/bicycle access from the East Urban Community- Phase 1 to the commercial area. • Concern with the existing condition of Mer Bleue and Renaud Roads and the traffic associated with construction. Would like the Brian Coburn extension to Pagé/Navan Roads to be completed sooner rather than later in order to alleviate traffic. • Request for a new park and ride in the area in order to alleviate the need to take express bus routes. • Concern with cut through traffic along Renaud Road and connections to Innes. • Request to upgrade Mer Bleue & Renaud Road. • Request to extend Brian Coburn now. • Request to build Belcourt (Frank Bender Street/Fern Casey Street) from water tower to Renaud Rd.

Parks, Schools and Greenspace	• Request to ensure some green space remain, citing it as the reason a lot of people chose to live in the area. • Request to ensure the protection of Innes Woods. • Request to provide a community / recreation center for residents with safe access. • Request for information related to timing for upgrades for Primary school and Secondary French school on Renaud.
Commercial	• Request for a farmer's market or more local store-type area (as opposed to big box stores), similar to Manotick/Merrickville or Lansdowne, was preferred to “add personality” and create a "town within a town".
Surface Water	• Request for implementation of appropriate flood mitigation and surface water management.

These issues were incorporated and addressed in the subsequent Community Design Plan (CDP*),* Master Servicing Study (MSS) and Master Transportation Study (MTS).

As part of the CDP/MCEA process, Indigenous Groups were provided information relating to the development of the CDP. The City of Ottawa’s Development Applications process circulates area residents with upcoming development applications and associated reports. This information was passed onto the Algonquins of Ontario with an offer to receive comments. No additional comments were received.

Throughout the project the Core Project Team met with key agency stakeholders and City staff with an interest in the project (TAC). Reports and Plans were circulated for comments and revisions made accordingly. Please refer to ***Appendix A*** for key comments provided by TAC members related to the information contained in this MSS. Please refer to ***Appendix I*** for an inventory of all key agency responses related to the information contained in this MSS.

Please note that the inventory of comments & responses provided in the MSS excludes comments related to existing conditions reports, planning matters, transportation matters, etc. These comments and associated responses are found in the following documents, under separate cover:

- Community Design Plan (Fotenn, October 2019);
- Master Transportation Study (Castleglenn, May 2019);
- Existing Conditions Reports (Various, 2015); and,
- Consultation Report (Morrison Hershfield, November 2018).

4.0 EXISTING CONDITIONS AND SITE CONSTRAINTS

The information that follows offers highlights of key existing conditions that have shaped the servicing strategy for the EUC Phase 3 Area CDP. The information can also be seen in ***Exhibit 2,*** below. The list of relevant subject areas is not exhaustive, nor are the summaries of constraints. Please refer to the CDP (Fotenn, October 2019) and the Consultation Report (Morrison Hershfield, November 2018) for additional details.

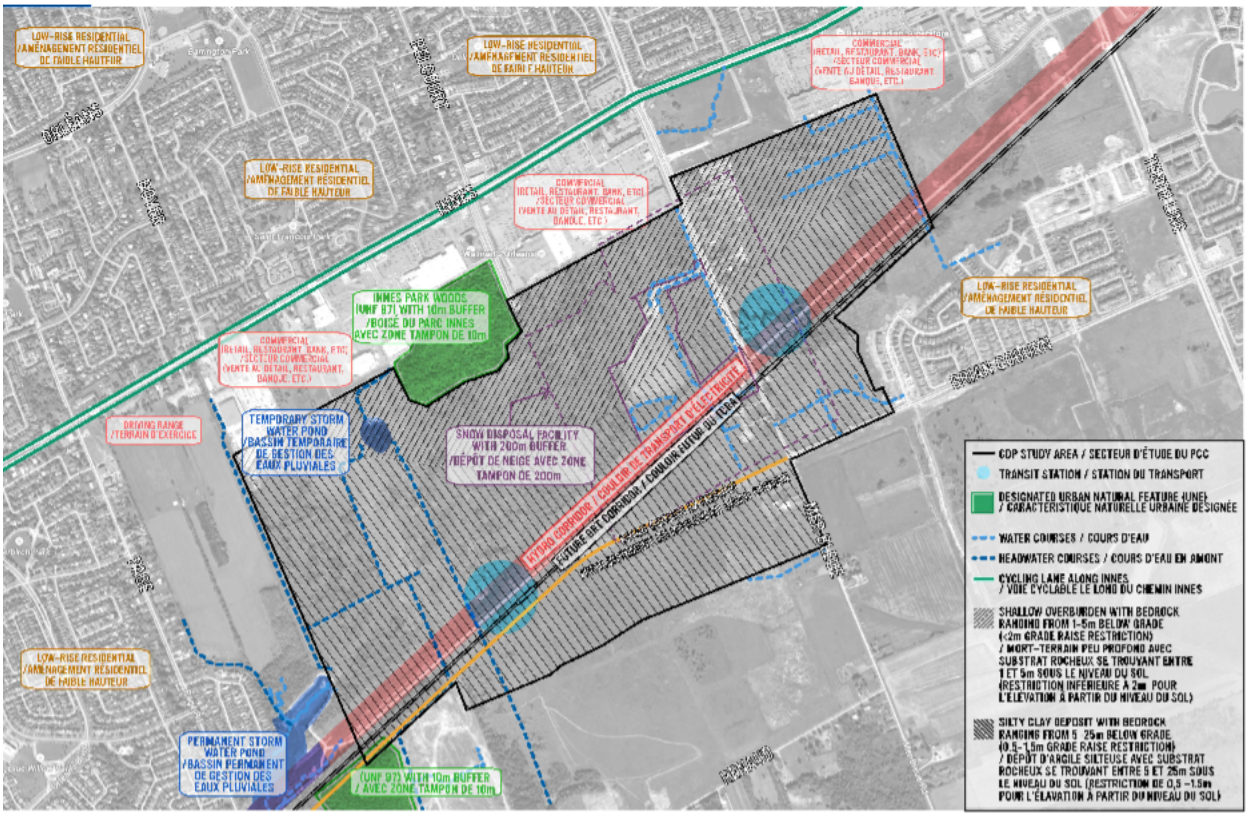

Exhibit 2: constraints and Opportunities (Fotenn, 2018)

4.1 Land Ownership

The EUC Phase 3 Area subject area is comprised of multiple landowners with lands of varying size. Please see the *EUC Phase 3 Area CDP - Terms of Reference* (Richcraft Homes, June 2014) included in ***Appendix A*** for additional details.

4.2 Geotechnical Conditions

Geotechnical investigations of the subject area have been undertaken by Paterson Group. Key implications are discussed herein, while full details are provided in the *Geotechnical – Existing Conditions Report East Urban Community Mixed Use CDP* (Paterson Group, July 7, 2019).

The preliminary geotechnical investigation indicates that:

- **Soil Profile:** The overburden varies between shallow bedrock and deep silty clay deposit. Based on available geological mapping, the overburden drift thickness is 0 to 30 m in depth.
- **Bedrock:** Based on available geological mapping, the bedrock within the subject area consists of interbedded limestone and dolomite of the Gull River formation. Based on the borehole and test pitting program, the bedrock ranges from 1 m to 25 m below the existing surface. Proposed development within bedrock may require blasting; specific blasting requirements would apply.
- **Preliminary Grade Raise:** A grade raise restriction of 0.5 m to 1.5 m applies for the South West and South East quadrants, as well as the southern portions of the North West and North East quadrants. A grade raise restriction of 2 m was recommended for the northern portions of the North West and North East quadrants.
- **Groundwater:** The groundwater table is expected to be between 1.5 m and 2.5 m below existing ground.

The above-mentioned elements informed the evaluation of servicing solutions and the preferred servicing designs included herein. As site-specific designs advance, a licensed geotechnical engineer is required to carry out final geotechnical investigations, complete with a review of any detailed grading plans.

4.3 Hydrogeology

The hydrogeology of the subject area has been analyzed by Paterson Group and Palmer Environmental Consulting Group. Key implications are discussed herein, while full details are provided in the *Existing Conditions Report: Hydrogeology: East Urban Community MUC CDP* (Paterson Group, October 2, 2014) and the *Pre-Development Hydrogeological and Water Budget Assessment, East Urban Community Mixed Use Centre Development – Preliminary Findings* (Palmer Environmental Consulting Group, December 19, 2014).

The preliminary hydrogeological investigation indicates that:

- **Groundwater Recharge:** 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).

  At the western limit of the subject area, surficial glaciomarine sand has been identified. This area has been classified as a Significant Groundwater Recharge Area and a Highly Vulnerable Aquifer. No mitigation for changes to infiltration are recommended for the area of glaciomarine sand. Exposed fractured bedrock at the northern limit of the subject area has also been classified as a Significant Groundwater Recharge Area and a Highly Vulnerable Aquifer. It is recommended that pre-development infiltration rate be maintained in the area of exposed bedrock. Changes in infiltration, outside of the significant recharge areas, are not considered to have an adverse impact

to the water budget or natural water features within the study area, per the *Pre-Development Hydrogeological and Water Budget Assessment, East Urban Community Mixed Use Centre Development – Preliminary Findings* (Palmer Environmental, December 19, 2014).

- **Groundwater Flow:** There is reported to be a flow system within the overburden and a flow system in the bedrock. The preferential pathway for groundwater flow is either towards Bilberry Creek and the Ottawa River to the north, or Mud Creek and Green's Creek to the south.
- **Aquifers:** There are two usable aquifer systems present within the bedrock in which existing water wells on-site and within adjacent lands intercept. The Middle Ordovician Bedrock Aquifer is present at the northern limit of the subject area, while the Upper Ordovician Bedrock Aquifer is present at the southern limit.
- **Wells:** It is anticipated that water supply wells are the primary source for drinking water for existing residential properties within the subject area. The wells are recommended to be decommissioned prior to the start of construction within the EUC Phase 3 subject area and must be done under the supervision of a qualified Professional Engineer of Ontario or Professional Geoscientist.

The above-mentioned elements informed the evaluation of servicing solutions and the preferred designs included herein, along with the recommendations for mitigation measures to be implemented. For example, the decommissioning of wells would be phased according to the provision of watermains (e.g. to replace the function of the existing wells, where applicable) – see ***Section 13*** of this report for well monitoring requirements and additional mitigation measures.

4.4 Drainage

The study area and surrounding lands have been developed in phases, so drainage characteristics have continuously evolved over time. Depending on the snapshot in time being considered, the study area has different portions draining to Mud Creek, McKinnon's Creek, and Bilberry Creek. The various background studies have different watershed split lines, depending on the time of completion and available information. For example, SNC and RVCA boundary mapping within the study area show different watershed limits.

As an example, City topographic mapping from 2005 - 2009 has been used in ***Figure 2*** to show that prior to urban development in the area, the majority of the western quadrants drained by sheet flow to the EUC Pond 1 which is tributary to Mud Creek. Portions of the western quadrants were also tributary to McKinnon's Creek & Bilberry Creek. McKinnon's Creek flows southeasterly into Bear Brook and eventually the South Nation River. Due to development in the area, the majority of the western quadrants is currently directed towards the existing EUC Pond 1 as opposed to McKinnon's Creek, whose flows are now being captured and routed towards the Avalon West (Neighbourhood 5) Stormwater Management Facility.

The City of Ottawa is currently undertaking a cumulative impacts study of Mud Creek to determine design criteria for future developments and City projects, and a retrofit plan for existing development tributary to Mud Creek that will mitigate erosion impacts on the creek. The study also plans to recommend off-site/in-stream works to improve stream resilience and natural riparian/aquatic functions. Portions of the EUC Phase 3 Area CDP tributary to Mud Creek and EUC Pond 1 are within the cumulative impacts study scope. The CDP project team has shared relevant information with the City of Ottawa throughout the development

of this MSS in order to inform the ongoing Mud Creek project. Future coordination is expected to be required for the detailed design of EUC Pond 1 expansion, as the ongoing Mud Creek study may recommend specific changes to the EUC Pond 1 outlet structure.

A portion of the North East quadrant is tributary to Bilberry Creek (north of Innes Road) which outlets to the Ottawa River. The South East quadrant and the remaining portion of the North East quadrant are tributary to McKinnon's Creek to the south.

A review of the Bilberry Creek subwatershed was completed by the City of Ottawa in the *Bilberry Creek Geomorphic Systems Master Implementation Plan* (GHD, May 2014) and included recommended areas for rehabilitation to address the erosive nature of the existing creek. No specific recommendations are believed to have been given for the EUC Phase 3 Area CDP lands tributary to Bilberry Creek within the *Bilberry Creek Geomorphic Systems Master Implementation Plan* that would specifically alter the stormwater management plans set out in background studies, however the report points to an overarching concern with erosion forces in Bilberry Creek.

The City of Ottawa's *Eastern Subwatersheds Stormwater Management Retrofit Study (Morrison Hershfield, December 21, 2018)* also addresses drainage conditions in the Bilberry Creek watershed. The study developed a long-term retrofit plan to apply stormwater management within the watershed, to improve water quality and achieve a sustainable flow regime. The report specifically recommends stream restoration works in Bilberry Creek. No specific recommendations are believed to have been given for the EUC Phase 3 Area CDP lands tributary to Bilberry Creek, however the report points to an overarching concern with erosion forces in Bilberry Creek.

4.5 Natural Environment Features

4.5.1 Species at Risk (SAR) and Other Species of Interest

Per the environmental investigations undertaken for the EUC Phase 3 Area CDP, the servicing strategy itself does not require specific strategies for the protection of Species at Risk (SAR) and other species of interest; however, identification of species, general impact assessment related to the development, and proposed mitigation measures for future work apply. Please refer to the CDP (Fotenn, October 2019), the Environmental Impact Statement (***Appendix H***, Kilgour, September 5, 2018), and ***Section 13*** for additional details.

4.5.2 Natural Heritage System and Headwater Assessment

The natural heritage system and headwater drainage features of the subject area have been analyzed by Niblett Environmental Associates. Key implications are discussed herein, while full details are provided in the Headwater Drainage Feature Assessment (Niblett Environmental Associates, March 28, 2018).

The subject area is within both the Rideau Valley Conservation Authority and the South Nation Conservation Authority. Two headwater features within the Rideau Valley Conservation Authority jurisdiction, flowing towards the existing EUC Pond 1, have mitigation management recommendations per the *Headwater Drainage Feature Assessment* (Niblett Environmental Associates, March 28, 2018). These

headwater features are not required to be maintained, but their functionality must be replicated or enhanced through lot level conveyance measures. All other headwater features have no management required.

There are two headwater features adjacent to the existing SWM pond that are to be protected in place. Details are provided in the Headwater Assessment for 3490 Innes Road site (Kilgour & Associates, July 2017).

A Significant Woodland has been identified adjacent to the existing SWM pond. Please refer to the *Technical Memorandum* (Kilgour, June 2019) and other environmental reports in ***Appendix H*** for the specific boundary of the woodland that is to be protected in place.

The above-mentioned requirements informed the evaluation of servicing solutions and the preferred designs included herein, along with the recommendations for mitigation measures to be implemented.

4.5.3 Limit of Development

Detailed site specific studies have been undertaken to define development constraints as they relate to the existing natural environment conditions. The headwater features and Significant Woodland near the western boundary of the study area, and the rock barren to the north of the study area were identified to require development setbacks. Please refer to the CDP (Fotenn, October 2019), the Consultation Report (Morrison Hershfield, November 2018), the Environmental Impact Statement (***Appendix H***, Kilgour, September 5, 2018), and ***Section 13*** of this report for additional details.

The rock barren surrounding the Innes Park Woods is considered a Significant Wildlife Habitat. Garter snakes, eastern ribbon snakes, and copperbelly water snakes were identified in the area. Per the CDP, a 30 m setback was applied from the limit of the rock barren, followed by an additional 5 m buffer per discussions with Niblett Environmental Associates Inc., the Ministry of Natural Resources and Forestry, and City of Ottawa Environmental Planning staff.

The setbacks from the headwater features near the EUC Pond 1 have been defined within the following documents:

- Headwater Drainage Feature Assessment 3490 Innes Road Development (Kilgour & Associates, July 27, 2017);
- Slope Stability Assessment Reaches 7 and 12 Storm Water Management Pond Block (Golder Associates, June 2019); and
- Environmental Impact Statement for SWM Pond Expansion in East Urban Community Mixed Use Centre (Kilgour & Associates, September 5, 2018).

Preliminary discussions with the RVCA were also taken into consideration when determining the appropriate limits of any expansion to EUC Pond 1. As such, the greater of 30 m and 15 m environmental setbacks from the normal high water mark of the headwater feature, and 11 m and 7 m setbacks from the top of slopes are to be provided from Reaches 7 and 12, respectively. The geotechnical setback limits are

per the *Slope Stability Assessment Reaches 7 and 12 SWM Pond Block* (Golder Associates, June 2019). See ***Appendix H*** for additional details. In this case, the environmental setback requirements govern.

The above-mentioned elements informed the evaluation of servicing solutions and the preferred pond footprint designs included herein, along with the recommendations for mitigation measures to be implemented – see ***Section 13*** of this report for additional information on mitigation measures.

4.6 Existing Land Use and Adjacent Land Uses

Existing land uses within the subject area include agricultural fields and associated buildings, rural residential development along Mer Bleue Road, vacant lands, commercial buildings fronting Innes Road and Mer Bleue Road, a snow disposal facility, and stormwater management facilities. Please refer to the CDP (Fotenn, October 2019) and the Consultation Report (Morrison Hershfield, November 2018) for additional details.

Existing Brian Coburn Boulevard, Mer Bleue Road and Fern Casey Street run through the subject area. An existing Hydro One corridor runs through the middle of the subject area, generally along the alignment of Brian Coburn Boulevard. The land is owned by Richcraft and City of Ottawa, with easements/agreements for Hydro One operations.

Existing and proposed residential developments are located to the west and south of the subject area. Existing commercial developments exist to the north and northeast of the subject area.

Generally speaking, there is existing municipal water, wastewater, and stormwater services abutting the CDP area, including infrastructure within Mer Bleue Road and the Hydro Corridor. See ***Drawing 1*** for summary of municipal services in the vicinity of the site. Details of existing infrastructure are provided in ***Sections 9.0 – 11.0*** that follow. The area has been contemplated for urban development since at least the 1990's, so much of the downstream infrastructure has been constructed with allowances for the development of the EUC Phase 3 CDP area. For example, an existing stormwater management facility called EUC Pond 1 was constructed by the City to serve the part of the EUC Phase 3 CDP area that is west of Mer Bleue Road, among other lands. The pond is located just west of the CDP boundary, with a main cell and forebay each on the north and south side of the Hydro corridor. The availability of downstream capacity in the existing municipal infrastructure informed the evaluation of servicing solutions and the preferred servicing designs included herein, along with the recommendations for mitigation measures to be implemented – see ***Section 12.0*** for additional information on mitigation measures.

4.7 Opportunities and Constraints

Based on the inventory of existing conditions:

- There is an opportunity to develop the subject area, while protecting the existing watercourses that have been identified for protection from alteration and development. Specific components of the natural heritage system are required to be protected from alteration and development.
- The general urbanization of the subject area is expected to increase runoff and could increase erosive forces in downstream receivers. Generally speaking, directing controlled post-

development flows to respect the existing infrastructure/receivers is expected to provide opportunity to limit release of runoff from development slowly over time, to mitigate erosive forces in run off.

- 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. At the western limit of the subject area, surficial glaciomarine sand has been identified and classified as a Significant Groundwater Recharge Area and a Highly Vulnerable Aquifer. Similarly, exposed fractured bedrock at the northern limit of the subject area has been classified as a Significant Groundwater Recharge Area and a Highly Vulnerable Aquifer. Pre-development infiltration rates are to be maintained in this significant area of exposed bedrock, through low impact development measures, layout of land uses, etc.
- There is an expected opportunity to support the development of the EUC Phase 3 Area CDP by connecting to the existing municipal watermain, sanitary, and stormwater infrastructure. An allowance for capacity is expected within the receiving sewer systems to support all or part of the proposed developments.
- A preliminary grade raise restriction of 0.5 m to 1.5 m is associated with development within the majority of the site. A preliminary grade raise restriction of 2 m is recommended for the northern portions of the North West and North East quadrants. The grading plans are to have regard for this constraint; bearing in mind that there is an identified opportunity for betterment (reduction) of these restrictions through additional study and programs such as a long-term settlement plan or a lightweight fill plan.

5.0 NEED AND JUSTIFICATION FOR MUNICIPAL SERVICING

5.1 Vision & Goals for the EUC Phase 3 CDP

Per the CDP (Fotenn, October 2019), it is envisioned that the EUC Phase 3 CDP study area will be a hub of activity for the residents of Orléans and surrounding communities. Its mix of housing, offices, shops and commercial services, combined with leisure and recreational opportunities, will make it an attractive place to live, work, and play. Rapid transit will have successfully transitioned from bus priority measures on roadways shared with other traffic, to buses travelling on an exclusive Bus Rapid Transit (BRT) right-of-way. The BRT will provide excellent connections for commuters travelling to jobs in other communities or arriving to work in the Mixed Use Centre, which will offer a range of employment opportunities. An offset grid pattern road network with regularly spaced intersections will allow for efficient transit, cycling, and vehicular travel and pedestrian movements. The Hydro Corridor will provide a strong linear corridor for pedestrians and cyclists and will form part of a Greenspace network which links features such as Innes Park Woods, watercourses, parks, and open spaces. With its compact form, mix of uses, and strong orientation towards walking, cycling and transit, the Mixed Use Centre will be a model of sustainable design and development.

The following goals have been established to support the vision for the CDP:

- Establish a new, vibrant centre in Orléans which accommodates a range of uses, such as office, low, medium, and medium-high density residential, retail, entertainment, and institutional uses, and acts as a central node of activity for the surrounding community and the City as a whole.
- Achieve compact growth which makes efficient use of land and existing infrastructure and is phased in step with required infrastructure improvements.
- In anticipation of the future BRT Transitway, establish a Transit-Oriented Development pattern which incorporates “complete streets”, which provide safe, convenient and comfortable conditions for walking, cycling and public transit for all ages and abilities.
- Ensure that connections across the Hydro Corridor, the Transitway, and Brian Coburn Boulevard are provided for the safe and efficient passage of pedestrians, cyclists, and motorists from one side of the Community Design Plan (CDP) area to the other.
- Foster growth that complements the existing community of Orléans and facilitates connectivity between the Transit Stations and surrounding neighbourhoods through such measures as multi-use pathways (MUPs), safe road crossings, and an efficient road network.
- Protect, improve and restore the Natural Heritage System within and adjacent to the CDP area and create a Greenspace Network which connects natural features, such as woodlands, stormwater ponds, community features, such as public parks, and shopping areas.
- Encourage the establishment of a distinct identity for the currently undeveloped CDP area through the creation of area-specific design guidelines which recognize and celebrate existing features and promote the creation of new public parks and civic spaces that contribute to a sense of place and foster a sense of community.

- Support the economic development potential of Orléans by creating development opportunities within this CDP area for a range of employment uses that are well-served by transit.

5.2 Servicing Problem Statement

A servicing strategy is needed to support the wastewater collection requirements, water demands, storm drainage requirements, and stormwater management requirements for the proposed land uses within the EUC Phase 3 CDP area. The servicing strategy must be consistent with the Provincial Policy Statement (PPS), must meet City of Ottawa requirements, must meet the requirements of other approval agencies (e.g. Ontario Ministry of Environment, Conservation, and Parks, Ontario Ministry of Natural Resources and Forestry, South Nation Conservation, Rideau Valley Conservation Authority, etc.), and must demonstrate good engineering practice for the protection of public safety, the environment, and sustainable operation.

6.0 IDENTIFICATION AND EVALUATION OF ALTERNATIVE SERVICING SOLUTIONS

Alternative solutions have been evaluated in terms of their ability to meet the problem statement (e.g. their ability to support the proposed level of development and their ability to meet relevant regulations and guidelines) and their expected net environmental impacts, including consideration of social and natural environments.

6.1 Water Distribution Alternatives

- **Do Nothing:** By not developing any water infrastructure, the problem statement would not be addressed, as the proposed urban development could not be supported.
- **Construct Private or Communal Wells:** Private or communal wells are not expected to support the water demands for the proposed urban development. This solution would not be consistent with the Provincial Policy Statement or other agency guidelines, which state that municipal service is the preferred form of water supply in urban areas.
- **Expand Existing Municipal Water System:** Expanding the municipal water system would provide safe and reliable drinking water to the new community, would offer wide-spread fire protection, would make efficient use of existing capacity, and would be consistent with City servicing practices for the urban area.

Based on the assessment summarized above, expanding the existing municipal water system is the preferred solution for water distribution for the proposed development in the EUC CDP area.

6.2 Wastewater Collection Alternatives

- **Do Nothing:** By not developing any wastewater infrastructure, the problem statement would not be addressed, as the proposed urban development could not be supported.
- **Construct Private or Communal Septic Systems:** Private or communal septic systems are not expected to support the wastewater generated by the proposed urban development. This solution is not consistent with the Provincial Policy Statement or other agency guidelines, which state that municipal sewage services are the preferred form of servicing within urban areas.
- **Expand Existing Municipal Wastewater System:** Municipal sewage services are the preferred form of servicing for urban areas in Ontario, as per the Provincial Policy Statement. An extension of the existing sewer system would make efficient use of existing capacity and is considered the best alternative solution to address the problem statement.

Based on the assessment summarized above, expanding the existing municipal wastewater system is the preferred solution for wastewater collection for the proposed development in the EUC CDP area.

6.3 Stormwater Collection Management Alternatives

- **Do Nothing:** By urbanizing the subject lands and not developing any stormwater management infrastructure, the problem statement would not be addressed, as City and other agency requirements for environmental protection would not be met.

- **Open Ditches & Culverts for Stormwater Collection Systems:** Open ditches and culverts can be used in road rights-of-way (ROWs) and public lands (e.g. owned by the City of Ottawa, easement in favour of a utility, etc.) to convey stormwater runoff from the roadway and adjacent development blocks towards a downstream outlet. Open ditches provide an element of quality treatment, but alone are not expected to provide sufficient quantity or quality control for protection of downstream watercourses in accordance with agency guidelines, so would need to be paired with other stormwater management practices to address the problem statement. While open ditches and culverts are appropriate in rural/semi-rural settings and certain urban settings (ROWs widths accommodate ditches, elevation changes across the site allow for ditches to remain relatively shallow, etc.), open ditches and culverts alone along all ROWs would not be consistent with City of Ottawa guidelines, which state that municipal sewers are the preferred form of servicing within urban areas. Open ditches would get deeper and wider as they collect runoff from other ditches as they approach the outlet, requiring local and collector ROWs to be wider than City of Ottawa standard ROW cross sections, which would increase the amount of land dedicated to the transportation network within the CDP and would not facilitate the dense, compact urban community that is envisioned. The use of open ditches in select ROWs and public lands has been carried forward for inclusion in a stormwater 'treatment train' approach, which is a recommended approach in agency guidelines that uses a combination of practices to address stormwater runoff generated in urban environments.
- **Expand Existing and Construct New Municipal Stormwater Minor/Major Collection Systems:** A dual drainage system is a reasonable and feasible alternative stormwater management solution for the site, with the minor system consisting of underground storm sewers that accommodate runoff from frequent events, and the major systems consisting of overland flow routes for the less frequent, high intensity storm events in accordance with agency guidelines. However, the dual drainage system alone cannot support the stormwater management requirements of the development area: the storm sewers and overland routes do not provide sufficient quantity or quality control for protection of downstream watercourses in accordance with agency guidelines, so would need to be paired with other stormwater management practices to address the problem statement.
- **Implement Stormwater Control & Treatment within Development Blocks and Rights of Way:** Controls on development lots/blocks and in rights of way - such as rooftop storage, parking lot storage, underground storage, oil and grit separator units, open ditches, pervious pipe infiltrations systems, rear yard storage, etc. - can contribute to meeting agency requirements for stormwater quantity control, stormwater quality control, and infiltration objectives for the proposed urban development plan. In addition, storage within Parks and Hydro Corridor lands can contribute to meeting agency guidelines for stormwater management. These controls alone are not expected to be sufficient to meet agency guidelines for protection of downstream watercourses, especially due to the specific soil conditions in the proposed urban development area. These controls have been carried forward for inclusion in a stormwater 'treatment train' approach, which is a recommended approach in agency guidelines that uses a combination of practices to address stormwater runoff generated in urban environments.

- **Expand Existing Stormwater Management Pond**: There is an existing stormwater management wet pond, EUC Pond 1, that has already been constructed adjacent to the proposed urban development area and was planned to service part of the CDP area. Wet ponds are a common type of stormwater management facility used throughout the City and the province, and can be designed to meet agency guidelines for protection of watercourses. In order to address the problem statement and meet all current agency guidelines, the existing pond would need to be expanded within the adjacent undeveloped area. The amount of land required to support an expansion is less than that which would be required to support one or more new ponds. Therefore, pond expansion would make efficient use of existing infrastructure and is considered the best alternative solution to address the problem statement.

- **Construct New Large-Scale Stormwater Management Pond(s):** One or multiple new end-of-pipe stormwater management ponds are a feasible solution for stormwater management for the proposed urban development. Wet ponds are a common type of stormwater management facility used throughout the City and the province, and can be designed to meet agency guidelines for protection of watercourses. Because one or multiple new ponds would require additional land be dedicated to stormwater management and additional maintenance programs as compared to expansion of the existing pond, this alternative solution is not considered the best way to address the problem statement that prioritizes the efficient use of land and sustainable operation of infrastructure.

Based on the assessment above, a treatment train consisting of lot/block and rights-of-way controls, minor/major collection system and open ditch conveyance, and an expansion of the existing wet pond is the preferred solution for stormwater management for the proposed development in the EUC CDP area.

7.0 ASSESSMENT OF ALTERNATIVE NEIGHBOURHOOD CONCEPT PLANS

7.1 Preliminary Land Use Plans

The preferred servicing solution – to expand the existing municipal water and sanitary sewer network and to provide a treatment train of stormwater management techniques – was conceptually applied to preliminary alternative neighbourhood concept plans early in the development of the project.

For the evaluation of alternative neighbourhood concepts, the intent was to compare various alternatives to determine which best meets the vision and goals for the CDP area.

Criteria development and detailed evaluation of alternatives are described in the Consultation Report (Morrison Hershfield, November 2018). From a servicing and grading perspective, the concept plans were evaluated for:

- Minimizing construction, maintenance, and operations requirements for stormwater management facilities;
- Minimizing construction and operations requirements for deep sewers; and,
- Minimizing front-ending costs and allowing for efficient area development (e.g. phasing of collector roads and associated collector sewers and watermains).

The comprehensive and integrated analysis of the neighbourhood concept plans is presented in ***Table 4***, with details included in ***Appendix I***. The evaluation was presented and discussed with the Technical Advisory Committee (TAC). Based on the integrated analysis, Option 3 is the preferred alternative.

7.2 Assessment of Alternative Land Use Plans

The Impact Description Table, ***Table 3,*** was used to assess impacts of each land use plan. Based on where the impact sits in the scale, the preferred option for the specific criteria was identified in ***Table 4.***

Table 3: Impact Description (Morrison Hershfield, January 2018)

	Terms describing:		Definitions
	Negative Impacts	**Positive Impacts (i.e., Benefits)**	
Most Preferred	Negligible/ Low	Greatest	• The impact exists, but is of a magnitude small enough that it has little effect, or is of limited benefit; or has the least impact compared to all the alternatives. • Greatest compliance, contribution or benefit.
↓	Slight	Good	• The impact exists and is of relatively low magnitude.

			• Provides a moderate effect or contribution or benefit.
↓	Some	Reasonable	• The impact exists and has an effect that is of a moderate magnitude. • Provides a measurable contribution or benefit.
Least Preferred	Greatest	Limited	• The impact exists and has an effect that is relatively large, or has the most impact when compared to other alternatives. • Little to no contribution or benefit

Other factors were considered in the evaluation but did not results in a distinguishing difference between the alternatives. These included:

- Provision of libraries;
- Parks adjacent to SWMP;
- Mix of uses adjacent to Bus Rapid Transit (BRT) station;
- Loss of water courses;
- Minimizing upgrades to existing water system requirements;
- Compatibility with existing and future municipal infrastructure;
- Impacts to existing downstream flood levels; and
- Disruptions of natural habitat (loss / fragmentation).

Table 4: Evaluation of Alternatives (Morrison Hershfield, 2018)

Category Catégorie	Criteria/Objective Critère/Objectif			
Natural and Physical Environment Environnement naturel et physique	Connectivity within the natural heritage system Connectivité dans le système du patrimoine national	✓	~	✓
	Amount of greenspace (parkland) quantité d'espaces verts (parcs)	~	~	✓
	Hibernacula/ Hibernacula	✓	×	✓
	Species at Risk/Espèces en péril	✓	~	~
	Protection of recharge areas/ Protection des zones de recharge	~	×	✓
Social Environment Environnement social	Maximize access to community amenities/services Maximiser l'accès aux équipements communautaires et les services	✓	~	×
	Parks/Parcs	~	~	✓
	Provide appropriate mix of land uses considering ongoing snow disposal operations / Fournir un mélange approprié d'utilisation de terrains compte tenu des opérations d'élimination de la neige en cours	✓	×	~
Transportation Transport	Minimize traffic infiltration through the community Minimiser l'infiltration du trafic à travers la communauté	~	~	✓
	Efficiency of road network / Efficacité des réseaux routiers	✓	~	✓
	Create an efficient transit system / Créer un système de transport efficace	✓	~	✓
	Create active accessible neighbourhoods / Créer des quartiers actifs et accessibles	×	✓	~
Infrastructure / Infrastucture	Reduce construction, maintenance and operations requirements SWMF / Réduire les exigences de construction, d'entretien et d'opérations de l'installation de GEP	×	✓	✓
	Reduction of construction and operations requirements for sanitary servicing / Réduction de la construction et des exigences des opérations pour les services sanitaires	✓	×	✓
Economics Économique	Minimize front ending costs and allow for efficient area development / Minimiser les coûts initiaux et optimiser l'aménagement du territoire	✓	×	✓
	Preferred / Préféré			✓

Based on the evaluation, Option 3 is the preferred Option. Where other option(s) were preferred for a specific criteria, the benefits provided by that option were considered in a refinement of Option 3. This includes potential opportunities to create active accessible neighbourhoods.

7.3 Preferred Concept Plan & General Servicing Strategy

The preferred concept plan is provided in ***Appendix A.*** Specific refinements have been included since the original land use plans that were evaluated in ***Section 7.2***. Please refer to the CDP (Fotenn, October 2019) and the *Public Consultation Report* (Morrison Hershfield, November 2018) for additional details.

As noted in ***Section 1.0,*** for the purposes of this MSS, the EUC Phase 3 Area lands have been divided into four quadrants, with Mer Bleue Road, the Hydro Corridor and the study area boundaries serving as the quadrant limits. The quadrants are shown in ***Drawing 1***.

The North West quadrant is bound by the Hydro Corridor to the south, Mer Bleue Road to the east and the study area boundaries to the north and west. The quadrant was considered to be part of the Orléans Business Park within the MSU (Stantec, July 2006). The North West quadrant is proposed to have a mix of varying density residential, commercial, and park land uses.

The North East quadrant is bound by the Hydro Corridor to the south, Mer Bleue Road to the west and the study area boundaries to the north and east. The quadrant was considered to be part of the Bilberry Creek Industrial Park within the MSU (Stantec, July 2006). The North East quadrant is proposed to have a mix of employment, commercial, park, and mixed-use land uses.

The South West quadrant is bound by the Hydro Corridor to the north, Mer Bleue Road to the east and the study area boundaries to the south and west. The quadrant was considered to be part of the Gloucester EUC Expansion Area as a mixed-use area, then changed to a mix of mixed-use and residential land uses as part of the Servicing Report for Trails Edge (DSEL, July 2017). The South West quadrant is proposed to have a mix of varying density residential, commercial, park, and mixed-use land uses. Note that a portion existing arterial Brian Coburn Boulevard exists within the South West quadrant.

The South East quadrant is bound by the Hydro Corridor to the north, Mer Bleue Road to the west, and the site boundaries to the south and east. The quadrant was considered to have mixed-use and commercial land uses within the Mer Bleue CDP ISS (IBI, April 2006). The South East quadrant is proposed to have a mix of institutional, park, and medium density residential land uses.

Note that the Demonstration Plan corresponding to the Preferred Land Use Plan can also be seen in ***Appendix A.***

The road network included in the demonstration plan has been carried forward for the purposes of this MSS. The network serves only as a basis for high-level infrastructure capacity calculations contained in this MSS, and is subject to change. For example, a road pattern is shown in the MSS in the North East quadrant, even though no roads exist in the demonstration plan in this area and the roads are to be defined through site-specific applications (ongoing), the City's Vanguard Drive Environmental Assessment (ongoing), etc.

A summary of the land uses and population projections used for the development of servicing requirements is provided in ***Table 5***. Local roads (ROW varies) and collector roads (26m ROW) are included in the land use statistics. The roads are defined in the MTS (Castleglenn, May 2019). Specific definitions for each land use are provided in the CDP (Fotenn, October 2019).

Where adjacent lands were to be serviced by lands in the EUC Phase 3 Area CDP in background studies, allowances have continued to be provided, with boundaries refined per the latest landowner concepts where available. Please note that, specific to the lands outside the EUC Phase 3 Area CDP fronting on Innes Road, there may be opportunities to redirect sanitary and storm outflows to existing infrastructure on Innes Road, as opposed to through the CDP area. It is expected that this would be addressed as part of Planning Act approvals for these lands, and that this would constitute a minor amendment to this MSS provided the conditions described in ***Section 14.0*** apply. As part of the MSS, servicing capacity has been provided so as to not preclude development that was contemplated in background studies.

Similarly, it is expected that as specific parcels are developed within the study area, the number of persons and the associated servicing demands will be refined as part of *Planning Act* approvals. The MSS has been developed to account for flexibility at the detailed design level, by providing sewer sizing with reserve capacity, anticipating a 10% increase in water demands, etc. Alignment and sizing of infrastructure is subject to change as part of *Planning Act* approvals and would be treated as a minor change to this MSS, provided the conditions described in ***Section 14.0*** apply.

In the sections that follow, conceptual servicing easements are shown where specific blocks are considered to be efficiently serviced through neighbouring blocks, as opposed to through adjacent road frontage. These easements are conceptual in nature, and may be removed or relocated as part of detailed design as part of *Planning Act* approvals, depending on phasing, landowner costs, etc. This would be treated as a minor change to this MSS, provided the conditions described in ***Section 14.0*** apply.

Please note that as specific parcels are developed within the North East quadrant, stormwater management requirements are expected to be defined as part of *Planning Act* approvals, to address known erosion issues in Bilberry Creek. This MSS acknowledges that the City may choose to divert some flows away from Bilberry Creek (e.g. flows in the North East Quadrant, south of Vanguard Drive, may be redirected towards existing infrastructure within the McKinnon's Creek watershed). This may involve incorporating infiltration measures, surface or underground storage measures, etc., within the lands in the North East Quadrant. See ***Section 11.3*** for additional information.

Table 5: Development Statistic Projections Derived from Concept Plan (Fotenn, October 2019)

Quadrant	Land Use	Gross Area (ha) [1]	Projected Residential Units	Residential Population per Unit [2]	Projected Residential Population [2]
NW	Res - Low	43.82	453	3.4	4392
			1056	2.7	
	Res - Med	4.98	309	2.1	649
	Res - Med-High	8.47	677	1.8	1219
	Employment	24.61			
	Park	7.70			
	Other	6.91			
	NW Quadrant Total	**96.48**	**2495**		**6260**
NE	Mixed-Use	4.86	1406	1.8	2531
	Employment	20.71			
	Commercial	3.47			
	Park	0.19			
	NE Quadrant Total	**29.23**	**1406**		**2531**
SW	Mixed-Use	7.29	292	1.8	526
	Res - Med-High	6.65	532	1.8	958
	Res - Low	14.43	149	3.4	1447
			348	2.7	
	Commercial	4.30			
	Park	0.42			
	Brian Coburn Blvd	6.23			
	SW Quadrant Total	**39.32**	**1321**		**2931**
SE	Institutional	9.27			
	Park	0.36			
	Res - Med	0.99	84	-	227
	SE Quadrant Total	**10.62**	**84**		**227**
Misc.	Hydro Corridor	23.06			
	BRT	9.57			
	Mer Bleue Road	4.34			
	Collector Roads	10.42			
TOTAL		**223.04**	**5306**		**11949**

[1] NOTE: Areas and Projected Residential Units may differ from areas used in CDP and other background studies. Areas based on Richcraft Homes, October 2018 Concept Plan & Development Projections.
[2] NOTE: Population projections may differ from population estimates used in CDP and other background studies. Population projection and residential population per unit values are based on Ministry of Environment, Conservation, and Parks guidelines for servicing demand calculations. Local Roads are included in Block estimates above except where noted.

7.4 Phasing Strategy

The land uses, services, and earthworks described in this Master Servicing Study will be built out by separate landowners in separate discrete phases, according to the landowner's preferred timing. As such,

there may be works outside of phase limits that are required to support a certain phase of development. Timing and approval of such works are to be addressed as part of future detailed design and approval processes for development of the lands within the EUC Phase 3 CDP area.

8.0 IDENTIFICATION AND EVALUATION OF ALTERNATIVE SERVICING DESIGN CONCEPTS

Alternative design concepts exist to support the water supply solutions, wastewater collection solutions, storm drainage solutions, and stormwater management solutions for the subject area.

Alternative design concepts have been evaluated in terms of their ability to meet the problem statement (i.e. their ability to support the approved level of development and their ability to meet relevant regulations and guidelines) and their expected net environmental impacts. In considering net environmental impacts, consideration is given to impacts on: air, land, and water; plant, animal, and human life; social, economic, climate change, and cultural conditions; existing buildings and infrastructure; and the generation of noise, vibrations, radiation, and odours.

Details of key alternative design concepts are described in the relevant sections that follow:

- Water Servicing Alternative Designs Through Innes Park Woods ***(Section 9.2.3)***;
- Potential Additional Connections for Water Servicing Network ***(Section 9.2.3)***;
- Sanitary Servicing Alternative Designs for Employment Lands within the North West Quadrant ***(Section 10.2.3)***;
- Sanitary Servicing Trunk Alternative Alignment within the North West Quadrant ***(Section 10.2.3)***;
- Storm Servicing Trunk Alternative Alignment within the North West Quadrant ***(Section 11.2.6);***
- Alternative capture and storage rates for higher density land uses ***(Section 11.2.6);***
- EUC Storm Pond Expansion Alternative Designs ***(Section 11.2.6)***; and,
- Use of Sump Pumps for Foundation Drainage for Residential Uses in the South West Quadrant ***(Section 11.4.5)***.

Alternative ROW cross section design concepts are detailed in the Master Transportation Study (Castleglenn, May 2019), including evaluation of servicing and public utility impacts.

9.0 WATER SERVICING PLAN

9.1 Design Criteria

To assess serviceability and recommend a preferred trunk watermain network in support of the proposed development in the EUC Phase 3 CDP area, a water distribution model has been prepared for ultimate conditions using boundary conditions provided by the City of Ottawa (included in ***Appendix B***). All four quadrants are located within Zone 2E of the City's water distribution system, which includes the Innes Road elevated storage tank just north of the CDP area. Boundary conditions were requested at 2 locations, based on population projections from Section 7.4 (plus a 10% allowance for increase in population to account for minor amendments to land uses in the future) and relevant background studies for future developments surrounding the EUC Phase 3 Area CDP boundaries:

- **Boundary Condition Location 1:** Pressure Zone 2E, Innes Road, Existing 406 mm diameter DI watermain; and,
- **Boundary Condition Location 2**: Pressure Zone 2E, Mer Bleue Road, Existing 406 mm diameter PVC watermain.

The anticipated watermain pressures are summarized in ***Table 6***. The Ministry of the Environment, Conservation, and Parks (MECP) and City of Ottawa Guidelines indicate that it is best practice to have normal operating pressures between the range of 50 psi to 80 psi (345 kPa to 552k Pa). The information presented in ***Table 6*** demonstrates that there are sufficient watermain pressures available at the connection points, indicating there is capacity in the municipal watermain network to service the EUC Phase 3 CDP area. Further information regarding existing water supply conditions can be found within the *Hydraulic Capacity and Modelling Analysis East Urban Community Mixed-Use Centre Development* (GeoAdvice, July 2018), included in ***Appendix B***. Note that as development proceeds, the City is expected to provide new boundary conditions for separate developments within the EUC Phase 3 Area CDP, to inform the detailed design of the different developments considered within the watermain network.

Table 6: Existing Watermain Boundary Conditions (City of Ottawa, 2018)

Boundary Condition Location	Hydraulic Boundary Conditions- Hydraulic Grade Line (m)			
	Peak Hour	Maximum HGL	Max day+fire (10,000 L/min)	Max day+fire (15,000 L/min)
Innes Road	126.4m	130.3m	126.3m	126.1m
Mer Bleue Road	125.5m	130.3m	124.7m	124.3m

The applicable *Water Distribution Guidelines* (City of Ottawa, July 2010) and recommended consumption rates (City of Ottawa Email Correspondence, February 2018) that were used in the design of the water distribution network are summarized in ***Table 7***. The consumption rates differ from those reported in the *Water Distribution Guidelines* (City of Ottawa, July 2010), as the *Water Distribution Guidelines* are intended for the design for developments less than 50 ha. Email correspondence with the City of Ottawa staff, provided in ***Appendix B,*** confirms that the criteria presented in ***Table 7*** is appropriate for use in the EUC Phase 3 Area CDP.

Table 7: Water Supply Design Criteria

Design Parameter		Value
Extracted from Section 4: Ottawa Design Guidelines, Water Distribution (July 2010)		
Minimum Watermain Size		150 mm diameter
Minimum Depth of Cover		2.4 m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within		350 kPa and 480 kPa
During normal operating conditions pressure must not drop below		276 kPa
During normal operating conditions pressure must not exceed		552 kPa
During fire flow operating pressure must not drop below		140 kPa
City of Ottawa – Email Correspondence (February 2018)		
Residential – Single Family	Average Day	570 L/unit/day
	Outdoor Water Demand	1050 L/unit/day
	Max Day	Average + OWD (L/unit/day)
	Peak Hour	1.5 x Avg Day + 2.1 x Max Day (L/unit/day)
Residential – Multi-Family	Average Day	560 L/unit/day
	Outdoor Water Demand	0
	Max Day	Average (L/unit/day)
	Peak Hour	1.6 x Max Day (L/unit/day)
Residential - Apartment	Average Day	400 L/unit/day
	Outdoor Water Demand	0 L/unit/day
	Max Day	Average (L/unit/day)
	Peak Hour	1.6 x Max Day (L/unit/day)
Institutional / Commercial/ Industrial	Average Day	8500 L/ha/day
	Outdoor Water Demand	0 L/ha/day
	Max Day	Average Day (L/ha/day)
	Peak Hour	1.3 x Max Day (L/ha/day)
Total Average Day		Sum of Average Day for all land uses
Total Max Day		Sum Max Day for all land uses
Total Peak Hour		Sum of Peak Hour for all land uses
High Pressure Check		Minimum Hour = Average Day

At this stage of the design process, there is not enough information available to complete precise fire flow requirement calculations per the Fire Underwriter's Survey (FUS) method (as applied per City of Ottawa ISTB-2018-02). As such, a typical conservative estimate of 250 L/s (15,000 L/min) has been applied to the EUC Phase 3 Area CDP for sizing of trunk infrastructure. This is considered representative of commercial and employment uses. As detailed design advances for the lands, detailed fire flow calculations are to be

completed for the purpose of sizing local watermains. The trunk watermain network has been designed for the greater of the maximum day plus 250 L/s fire flow requirement and peak hour demands. In all cases, fire flow requirements govern watermain sizing.

Please note that for the purpose of long-term water demand estimates, the snow dump in the NW quadrant has been assumed as Employment lands, so as to not preclude development of this parcel at some point in the future.

Based on the water distribution model and the criteria presented above, the following distribution network has been recommended to service the four quadrants of the EUC Phase 3 Area CDP.

9.2 North West Quadrant Preferred Water Servicing Plan

9.2.1 North West Existing Water Supply Servicing

Along with the elevated storage tank, there is existing watermain infrastructure surrounding the North West quadrant. There is an existing 600 mm diameter watermain along the Hydro Corridor to the south, a 400 mm diameter watermain on Mer Bleue Road to the east and a 300 mm diameter watermain on Pagé Road to the west. There is also a 400-600 mm diameter watermain on Innes Road and a 300-600 mm watermain on Frank Bender Street (formerly Belcourt Extension) to the north of the quadrant. The surrounding watermain infrastructure is shown in ***Drawing 7****,* included with this report.

9.2.2 North West Water Supply Servicing Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service the North West quadrant of the EUC Phase 3 Area study area, which at the time was considered to be a business park. Per the MSU (Stantec, July 2006), the business park within the North West quadrant was to be serviced by connections to the surrounding watermain infrastructure on Innes Road, Mer Bleue Road and within the Hydro Corridor. A 400 mm diameter watermain was considered to run through the North West quadrant along Frank Bender Street (formerly named Belcourt Extension). Remaining watermains within the quadrant were considered as 300 mm diameter watermains. It should be noted that at the time of the MSU (Stantec, July 2006), the quadrant was zoned to be a business park, thus not requiring many roadways or watermains to service houses. The trunk watermain network considered within the MSU (Stantec, July 2006) is provided in ***Appendix C****.*

The North West quadrant was deemed serviceable by the trunk watermain network and the corresponding hydraulic modelling within the MSU (Stantec, July 2006). Fire flows greater than 500 L/s (30,000 L/min) were reported for the North West quadrant, surpassing the 217 L/s (13,000 L/min) flow required for ICI developments and meeting the 333 L/s (20,000 L/min) - 500 L/s (30,000 L/min) requirement for certain industrial facilities.

More recently, the water supply servicing of the North West quadrant was considered within the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017). Consistent with the MSU (Stantec, July 2006), a 400 mm diameter watermain was considered to run through the quadrant along Frank Bender Street (formerly named Belcourt Extension). Remaining watermains within the quadrant were considered

as 300mm diameter watermains. Required fire flows of 217 L/s (13,000 L/min) were reported, consistent with the required ICI flow from the MSU (Stantec, July 2006). The watermain network considered in the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017) can be found in ***Appendix C***.

The adjacent lands to the west of the North West quadrant are part of an approved development application. Per the *Design Brief for Caivan (Orléans Village) Limited – 3490 Innes Road* (DSEL, May 2018), a 300 mm diameter watermain stub is to be brought to the western boundary of the North West quadrant. This 300 mm diameter watermain ultimately connects to the 400 mm diameter watermain on Innes Road through the 3490 Innes Road lands, a slight deviation from the proposed network in the MSU (Stantec, July 2006). Details of the approved neighbouring watermain network is provided in ***Appendix C.***

Per the preferred concept plan, the North West quadrant consists mainly of residential and employment land uses, as opposed to the business park land use considered within the MSU (Stantec, July 2006). As such, the proposed water supply servicing design has been updated to reflect the updated land uses, road network and ongoing neighbouring development applications.

The proposed water supply servicing strategy for the North West quadrant is to have connections to the existing 600 mm diameter watermain within the Hydro Corridor to the south, the 400 mm diameter watermain on Mer Bleue Road and the 300 mm diameter watermain stub on Frank Bender Street to the North, consistent with the MSU (Stantec, July 2006). A connection to Innes Road is also proposed through the 3490 Innes Roads lands to the west. Due to the change in land use from the MSU (Stantec, July 2006), a 400 mm diameter internal watermain is no longer included in the water supply servicing strategy. A network of 300 mm diameter trunk watermains is proposed within the quadrant as shown in ***Figure 6,*** included along with this report. A network of local watermains and connections is assumed to service the North West quadrant. The details of the local watermain network are subject to change and will be addressed as design of the parcels comprising the North West quadrant advance.

For the purpose of design of the trunk watermain system, all land uses were assigned a fire flow requirement of 250 L/s (15,000 L/min). This surpasses the ICI fire flow requirement of 217 L/s (13,000 L/min) applied in the MSU (Stantec, July 2006), surpasses typical residential development fire flow requirement of 167 L/s (10,000 L/min), and is consistent with recent studies of similar scope in the City of Ottawa. This conforms to the interpretation of the ISTB-2018-02 guideline that future local watermains are not to be sized above 200 mm to achieve larger fire flow requirements.

A summary of the Water Supply servicing for the North West quadrant is provided in ***Table 8***.

The water supply servicing strategy for the North West quadrant was included in the *Hydraulic Capacity and Modelling Analysis East Urban Community Mixed-Use Centre Development* (GeoAdvice, July 2018). Results can be found in ***Appendix B*** and are summarized in ***Section 9.6***.

Table 8: Summary of Water Supply Servicing – North West Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006)	Servicing Report for Trails Edge and Orléans Business Park (DSEL, July 2017)	EUC Phase 3 Area CDP MSS (October 2019)
Servicing Strategy	300mm-400 mm diameter trunk watermains running through quadrant connecting to 400 mm diameter watermain on Mer Bleue, 400 mm diameter watermain on Innes Road and 600 mm diameter watermain within the Hydro Corridor.	300mm-400 mm diameter trunk watermains running through quadrant connecting to 400 mm diameter watermain on Mer Bleue, 400 mm diameter watermain on Innes Road and 600 mm diameter watermain within the Hydro Corridor.	300 mm diameter trunk watermains running through quadrant connecting to 400 mm diameter watermain on Mer Bleue, 400 mm diameter watermain on Innes Road, 300 mm diameter watermain on Frank Bender and 600 mm diameter watermain within the Hydro Corridor.

9.2.3 Consideration of Alternative Implementation Details for Servicing Designs

Connections to existing watermains using the proposed collector ROWs presents a looped redundant network that makes logical and efficient use of existing City infrastructure. Watermain sizing was optimized as part of MSS-level design, to address all City of Ottawa and MECP requirements. An alternative scenario was considered, whereby the connection to Innes Road via the existing watermain stub east of Innes Park Woods would not be completed. This would minimize disruption to the snake habitat in and around Innes Park Woods and adequate system pressures could be met for the remaining watermain network. However, the transportation analysis indicated the need for a road in this location and Niblett Environmental Consultants indicated that the disruption of adding the watermain at the time of road construction would not significantly change the impact of such works. As such, a watermain is recommended here in order to provide a well looped and redundant network.

Additional watermain connections were considered, including through the Hydro Corridor in order to provide additional connections to the existing 600mm dia watermain. For the purpose of this MSS, these connections are not required in order to provide an overall redundant & looped network, so have not been included as trunk infrastructure. However, depending on the phasing, additional local watermains and trunk connections such as those shown in ***Exhibit 3*** may be pursued as part of detailed design.

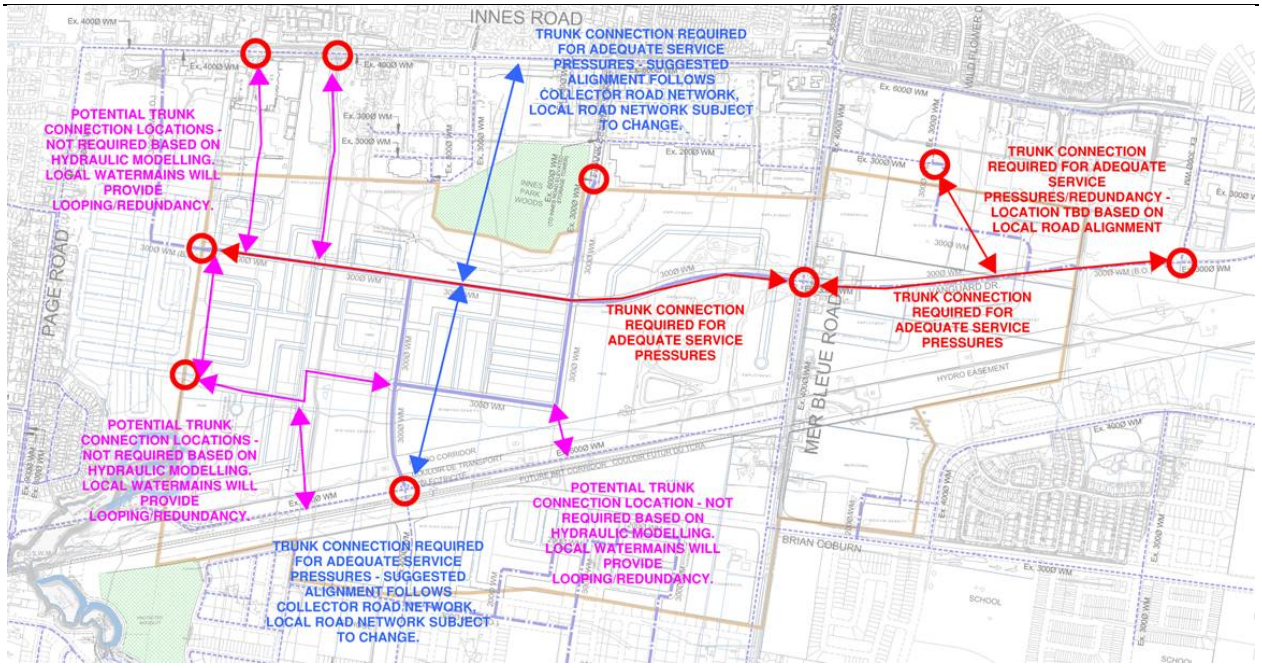

Exhibit 3: Trunk Watermain Connection Alternatives

9.3 North East Quadrant Preferred Water Servicing Plan

9.3.1 North East Existing Water Supply Servicing

The existing water supply infrastructure in the area consists of a 400 mm diameter watermain on Mer Bleue Road, a 600 mm diameter watermain on Innes Road and a 300 mm watermain stub on Vanguard Drive to the east of the quadrant. An existing watermain network, including 300 mm diameter trunk watermains exists within the commercial development to the north of the quadrant. The surrounding existing watermain network is shown in ***Drawing 7***.

9.3.2 North East Water Supply Servicing Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service this quadrant of the EUC Phase 3 Area study area, which, at the time of the MSU (Stantec, July 2006), was considered to be an industrial park. Per the MSU (Stantec, July 2006), the industrial park within the North East quadrant was to be serviced off of the surrounding trunk infrastructure. Namely, the 600 mm diameter watermain on Innes Road was considered to be the main connection to service the quadrant. In order to provide adequate fire protection to the quadrant, trunk watermains at a minimum 300 mm diameter were recommended on the major roadways (including the extension of Vanguard Drive). A fire flow requirement of 13,000 L/min (217 L/s) was applied for the Bilberry Creek Industrial Park in the MSU (Stantec, July 2006). The trunk watermain network considered in the MSU (Stantec, July 2006) is provided in ***Appendix C.***

As part of the ongoing development applications in the North East quadrant, the overall water supply servicing strategy has been refined. Per the *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018) and subsequent reports associated with the

development application, the quadrant is to be fed primarily from the existing 300 mm diameter watermain to the north, constructed as part of the existing developments, which is fed from the 400 mm diameter watermain on Mer Bleue Road and the 600 mm diameter watermain on Innes Road. A connection to an extension of the 300 mm diameter watermain within Vanguard Drive is also considered as part of the water servicing strategy. A fire flow of 11,000 L/min (183 L/s) was assumed in the *Site Servicing and Stormwater Management Report – Orleans II Draft Plan of Subdivision* (Stantec, April 12, 2018). The watermain layout considered within the *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018) is provided in ***Appendix C***. Per the *Servicing Options Report for Blacksheep Developments, 2159 Mer Bleue Road* (DSEL, December 2017), additional connections to the existing and proposed trunk watermains are proposed to service the entirety of the quadrant.

Respecting the development applications within the North East quadrant, and the MSU (Stantec, July 2006), the proposed water supply servicing strategy is to have a 300 mm diameter trunk watermains within major roads connecting to the extension of the 300 mm diameter watermain within Vanguard Drive and to the existing 300 mm diameter watermains that are part of the existing developments to the north. The proposed trunk watermain network is provided in ***Drawing 6***. Note that at this stage of analysis, only the trunk watermain within the quadrant is shown. A network of local watermains and connections is assumed to service the North East quadrant. The details of the local watermain network are subject to change and will be addressed as designs of the parcels comprising the North East quadrant advance.

A summary of the water supply servicing for the North East quadrant is provided in ***Table 9.***

Table 9: Summary of Water Supply Servicing – North East Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006)	Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision (Stantec, April 12, 2018) & subsequent reports and Servicing Options Report for Blacksheep Developments 2159 Mer Bleue Road (DSEL, December 2017)	EUC Phase 3 Area CDP MSS (October 2019)
Servicing Strategy	300 mm diameter trunk watermains running through quadrant connecting to 400 mm diameter watermain on Mer Bleue, 600 mm diameter watermain on Innes Road and 300 mm diameter watermain on Vanguard Drive.	300mm-400 mm diameter trunk watermains running through quadrant connecting to 400 mm diameter watermain on Mer Bleue, 600 mm diameter watermain on Innes Road and 300 mm diameter watermain on Vanguard Drive.	300 mm diameter trunk watermains running through quadrant connecting to 400 mm diameter watermain on Mer Bleue, 600 mm diameter watermain on Innes Road and 300 mm diameter watermain on Vanguard Drive.

The water supply servicing strategy for the North East quadrant is included in the *Hydraulic Capacity and Modelling Analysis East Urban Community Mixed-Use Centre Development* (GeoAdvice, July 2018). Results can be found in ***Appendix B*** and are summarized in ***Section 9.6***.

9.3.3 Consideration of Alternative Implementation Details for Servicing Designs

Watermain sizing was reviewed as part of MSS-level design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area, the modelled watermain performance, and the efficient looped network that is proposed, no other logical or efficient alternative designs were advanced for additional analysis and evaluation.

9.4 South West Quadrant Preferred Water Servicing Plan

9.4.1 South West Existing Water Supply Servicing

An existing 400 mm diameter watermain exists within the South West quadrant on the future extension of Fern Casey Street. The 400 mm diameter watermain is connected to a 600 mm diameter watermain along the Hydro Corridor north of the quadrant, and a 300 mm diameter watermain on Renaud Road to the south of the quadrant. A network of watermains servicing existing developments exists to the south west of the quadrant and a 400 mm diameter watermain exists on Mer Bleue Road. The surrounding existing watermain network is shown in ***Drawing 7***.

9.4.2 South West Water Supply Servicing Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service the South West quadrant of the EUC Phase 3 Area study area, which, at the time of the MSU (Stantec, July 2006), was considered a mixed use centre. Per the MSU (Stantec, July 2006), the South West quadrant was to be serviced off of the trunk infrastructure surrounding the quadrant that was identified in the hydraulic model included within the MSU (Stantec, July 2006). See ***Appendix C*** for details of the hydraulic model included in the MSU (Stantec, July 2006). The model indicates 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road and a 300 mm diameter east-west watermain to the south of the quadrant. Local watermains varying in size from 150 mm to 200 mm diameter are shown to service the South West quadrant off the mains identified above. Fire flows of 108 L/s (6,500 L/min) for residential areas and 217 L/s (13,000 L/min) for non-residential areas were assigned as part of the hydraulic analysis. Per the MSU (Stantec, July 2006), it was recommended that any future work on the water network in the area consider higher fire flows. The South West quadrant was deemed serviceable in the MSU (Stantec, July 2006).

More recently the water supply servicing for the South West quadrant has been considered within the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017). The watermain network was updated to reflect an updated road network and projected land uses. Consistent with the MSU (Stantec, July 2006), a network of 150 mm-300 mm diameter watermains was proposed to service the South West quadrant off the 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road. Per the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017), commercial fire flow requirements were consistent with the MSU (Stantec, July 2006) and residential fire flow requirements were refined and taken as 100 L/s (6,000 L/min) for detached single homes and 125 L/s (7,500 L/min) for townhomes.

Excerpts from the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017) are provided in ***Appendix C.***

As part of the approved development application bordering the South West quadrant, the overall water supply servicing strategy for the quadrant has been recently reconsidered. The *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017) proposed the South West quadrant be serviced by existing watermains on Mer Bleue Road, Renaud Road and Fern Casey Street (formerly named Belcourt Boulevard), and a proposed 300 mm watermain running through the South West quadrant consistent with the MSU (Stantec, July 2006). The Trailsedge East lands are currently undergoing detailed design & construction per the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018) and subsequent reports associated with the development application. Based on the construction of certain lands within the MSU (Stantec, July 2006) hydraulic model, minor deviations from the MSU (Stantec, July 2006) have been proposed within the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017) and the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018).

The *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017) proposes a network of 300 mm and 200 mm diameter watermains, deviating from the MSU (Stantec, July 2006) use of 150 mm diameter watermains. A minimum watermain diameter of 200 mm is expected to provide the entirety of the South West quadrant with a fire flow of 217 L/s (13,000 L/min), per the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017). See ***Appendix C*** for the proposed watermain system and excerpts from the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017). Note that while the watermain network is not shown extended into the South West quadrant, the quadrant was taken into consideration using the City of Ottawa's Water Supply Guidelines to estimate the quadrant's water demands.

Per the *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015), servicing of the portion of the South West quadrant west of Fern Casey Street was considered in the design of the existing watermains in the area. It was considered to be serviced off the existing watermain network to the south, via a 200 mm diameter watermain stub bordering the block.

Respecting the development applications within the South West quadrant, the proposed water supply servicing strategy is to have 200 mm to 300 mm diameter watermain trunks run through the South West quadrant connecting to existing surrounding watermains. Connections are proposed to the existing 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road via the future watermain network to the south. Note that certain watermains detailed within the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017) have been upsized to 300 mm diameter. The landowner to the south has been notified and the larger watermain is to be included in the future phases of Trailsedge East design. The portion of the South West quadrant west of Fern Casey Street is proposed to be serviced by the existing 200 mm diameter watermain stub bordering the block. A required fire flow of 250 L/s (15,000 L/min) was assumed throughout the quadrant, which is considered appropriate for the land uses being proposed.

The proposed watermain network is provided in ***Drawing 6***. Note that at this stage of analysis, only the trunk watermain within the quadrant is shown. A network of local watermains is assumed to service the

South West quadrant. The details of the local watermain network are subject to change and will be addressed as design of the parcels comprising the South West quadrant advance.

A summary of the Water Supply servicing for the South West quadrant is provided in ***Table 10***.

Table 10: Summary of Water Supply Servicing – South West Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006)	Trails Edge East – Functional Servicing Report (Stantec, August 11, 2017) and Design Brief for the Trails Edge West Richcraft Group of Companies (DSEL, January 26, 2015)	EUC Phase 3 Area CDP MSS (October 2019)
Servicing Strategy	150 mm to 200 mm diameter watermains connecting to the 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road and a 300 mm diameter east-west watermain south of quadrant.	200 mm and 300 mm diameter watermains connecting to the existing 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road via the proposed watermain network to the south. Portion of quadrant west of Fern Casey street to be serviced by 200 mm diameter stub bordering block.	200 mm and 300 mm diameter watermains connecting to the existing 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road via the proposed watermain network to the south. Portion of quadrant west of Fern Casey street to be serviced by existing 200 mm diameter stub off of Axis Way.

The water supply servicing strategy for the South West quadrant was included in the *Hydraulic Capacity and Modelling Analysis East Urban Community Mixed-Use Centre Development* (GeoAdvice, July 2018). Results are summarized in ***Section 9.6*** of this MSS and in ***Appendix B***.

9.4.3 Consideration of Alternative Implementation Details for Servicing Designs

Watermain sizing was reviewed as part of MSS-level design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area, the modelled watermain performance, and the efficient looped network that is proposed, no other logical or efficient alternative designs were advanced for additional analysis and evaluation. Additional connections to the existing 600mm dia watermain within the Hydro Corridor may be pursued as part of detailed design, depending on phasing – see ***Section 9.2.3.***

9.5 South East Quadrant Preferred Water Servicing Plan

9.5.1 South East Existing Water Supply Servicing

An existing residential development to the east of the quadrant has brought a 300 mm diameter watermain stub to the eastern property boundary. This stub connects to the 400 mm diameter watermain within Gerry Lalonde Drive. Existing 400 mm diameter watermains on Brian Coburn Boulevard and Mer Bleue Road are

adjacent to the site to the south and west, respectively. The surrounding existing watermain network is shown in ***Drawing 7.***

The portion of the South East quadrant designated as Medium Density has already been constructed and is being serviced by the above mentioned 300 mm diameter watermain stub and the 400 mm diameter watermain on Gerry Lalonde Drive.

9.5.2 South East Water Supply Servicing Design

The Mer Bleue CDP ISS (IBI Group, April 2006) reviewed the required infrastructure to service this quadrant of the EUC Phase 3 CDP area. Per the Mer Bleue CDP ISS (IBI, April 2006), the South East quadrant is to be serviced off of the trunk infrastructure surrounding the quadrant identified within the report: the 400 mm diameter watermains on Mer Bleue Road to the west, Brian Coburn Boulevard to the south, and Gerry Lalonde Drive to the east. The trunk watermain network considered in the Mer Bleue CDP ISS (IBI, April 2006) is shown in ***Appendix C***. Fire flow requirements of 6,500 L/min (108.33 L/s) for residential areas and 13,000 L/min (217 L/s) for commercial and institutional areas were contemplated in the Mer Bleue CDP ISS (IBI Group, April 2006). Since the publication of the Mer Bleue CDP ISS (IBI, April 2006), all three of the identified watermains have been installed and are operational. The existing watermain network surrounding the South East quadrant is shown in ***Drawing 7***. An independent looped watermain was anticipated within the quadrant and the proposed land uses in the Mer Bleue CDP were determined to be serviceable by the trunk watermains, per the hydraulic analysis completed as part of the Mer Bleue CDP ISS (IBI, April 2006).

As part of the ongoing development applications in the South East quadrant, the overall water supply servicing strategy has been refined. Per the *Orléans Family Health Hub Stormwater Management & Servicing Report* (Exp., April 5, 2018) and subsequent reports associated with the development application, a 200 mm diameter watermain is to run through the South East quadrant connecting to the 400 mm diameter watermain on Brian Coburn Boulevard and to the 300 mm diameter stub running from Gerry Lalonde Drive. A sprinkler flow of 1,920 L/min (32 L/s) is assumed for the Family Health Hub in the *Orleans Family Health Hub Stormwater Management & Servicing Report* (Exp., April 5, 2018).

Note that per the *Taggart Group of Companies Infrastructure Servicing Brie*f (Exp., November 20, 2013), private connection to the 400 mm diameter trunk on Gerry Lalonde Drive has been made to service the constructed Medium Density land within the South East quadrant. A fire flow of 6,300 L/min (105 L/s) was assumed in the *Taggart Group of Companies Infrastructure Servicing Brie*f (Exp., November 20, 2013).

Respecting the development applications within the South East quadrant, the proposed water supply servicing strategy is to have a 200 mm diameter watermain trunk run through the South East quadrant with connections to the existing 400 mm diameter watermains on Brian Coburn Boulevard and Gerry Lalonde Drive, respectively. The proposed watermain network is shown in ***Drawing 6***. Note that at this stage of analysis, only the trunk watermain within the quadrant is shown. A network of local watermains is assumed to service the South East quadrant. The details of the local watermain network are subject to change and will be addressed as designs of the parcels comprising the South East quadrant advance.

A summary of the Water Supply servicing for the South East quadrant is provided in ***Table 11***.

Table 11: Summary of Water Supply Servicing – South East Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Mer Bleue CDP ISS (IBI, April 2006)	Orléans Family Health Hub Stormwater Management & Servicing Report (Exp., April 5, 2018) and Taggart Group of Companies Infrastructure Servicing Brief (Exp., November 20, 2013)	EUC Phase 3 Area CDP MSS (October 2019)
Servicing Strategy	Local watermains within quadrant with possible connection to 400 mm diameter watermain on Mer Bleue Road, 400 mm diameter watermain on Brian Coburn Boulevard and 400 mm diameter watermain on Gerry Lalonde Drive.	200 mm diameter looped watermain which will be connected to the existing 400 mm diameter watermain on Brian Coburn Boulevard and the 400 mm diameter watermain on Gerry Lalonde Drive.	200 mm diameter looped watermain which will be connected to the existing 400 mm diameter watermain on Brian Coburn Boulevard and the 400 mm diameter watermain on Gerry Lalonde Drive.

The water supply servicing strategy for the South East quadrant is included in the *Hydraulic Capacity and Modelling Analysis East Urban Community Mixed-Use Centre Development* (GeoAdvice, July 2018). Results are found summarized in ***Section 9.6***, with details available in ***Appendix B***.

Note that within the *Hydraulic Capacity and Modelling Analysis East Urban Community Mixed-Use Centre Development* (GeoAdvice, July 2018), additional external demands were included for the future developments south of the quadrant based on information from the *Mer Bleue Urban Expansion Area 10 Master Servicing Study* (IBI Group, December 2017). See ***Appendix B*** for details. This area was included in order to conservatively account for the future developments that are not being considered within the City's current water modelling.

9.5.3 Consideration of Alternative Implementation Details for Servicing Designs

Watermain sizing was reviewed as part of MSS-level design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area, the modelled watermain performance, and the efficient looped network that is proposed, no other logical or efficient alternative designs were advanced for additional analysis and evaluation.

9.6 Modelling Results

Based on the detailed modeling for the proposed network, provided in ***Appendix B***, it is concluded that the proposed concept plan can be adequately serviced by the proposed trunk watermain network. A summary of the modelled service pressures are summarized in ***Table 12***.

Table 12: Summary of Available Service Pressures (GeoAdvice, 2018)

Minimum Hour Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
400 kPa (58 psi)	297 kPa (43 psi)

As stated in ***Section 9.1***, a fire flow requirement of 250 L/s (15,000 L/min) was assigned to all land uses for the purpose of trunk watermain network design in support of the proposed land uses in the EUC Phase 3 CDP area. A summary of the minimum available fire flows is shown in ***Table 13.***

Table 13: Summary of Minimum Available Fire Flows (GeoAdvice 2018)

Required Fire Flow	Minimum Available Fire Flow
250 L/s (15,000 L/min)	263 L/s (15,780 L/min)

The modelling and reporting provided in ***Appendix B*** indicate that the proposed watermain network can provide domestic flows to the subject area with service pressures within the acceptable range and can provide a required fire flow of 250 L/s at all modelled nodes. This fire flow is considered representative of the maximum allowable flow for residential uses under current City guidelines, and is suitable for planning purposes for the commercial, mixed use, institutional, and employment uses proposed (***Section 9.1***).

9.7 Commitments for Detailed Design

Detailed hydraulic analyses will be prepared for the phases of the proposed water distribution network at the time of their respective detailed designs, to determine that water supply is made available to the EUC Phase 3 Area as specified in the City of Ottawa Water Supply Guidelines.

The water distribution network will have to be designed to support the phased development of the lands making up the EUC Phase 3 Area. The phased water supply systems will be looped for areas > 50 m^3, per ISTB 2018-02-08, to provide for system security and redundancy.

The proposed trunk watermain network is shown to generally follow the proposed road network, with the exception of select conceptual servicing easements. Note that as the road network is conceptual in nature and is subject to change, the watermain network is also subject to change. Easements may be required for local and trunk watermains as detailed design progresses for the quadrant, in order to meet City and MECP guidelines.

During detailed design of the developments within the EUC Phase 3 Area:

- Demands will be updated and distribution refined, once more detailed development information is available;
- Demand factors according to Section 4.2.1 of the City of Ottawa *Design Guidelines* & subsequent Technical Bulletins will be used (for localized areas with populations less than 3,000 and/or areas less than 50 ha);
- Local watermain sizing will need to be evaluated at the subdivision approval stage; and,

- Individual residential and ICI blocks will be evaluated for required fire flow as detailed plans for these sites are developed.

9.8 Water Supply Conclusion

The EUC Phase 3 Area is to be serviced by a proposed network of trunk watermains varying in diameter from 200 mm to 300 mm. At this stage of analysis, only the trunk watermain within each quadrant is shown. A network of local watermains is assumed to service developments within the EUC Phase 3 Area.

The hydraulic analysis provided in ***Appendix B*** has been completed to ensure compliance with City of Ottawa Water Supply Guidelines. The proposed watermain network is expected to deliver all domestic and fire flows as per Ministry of the Environment, Conservation, and Parks (MECP), City of Ottawa and Fire Underwriters Criteria to support development within the EUC Phase 3 CDP area. Specifically, estimated fire flows of 250 L/s for all land uses can be achieved for the development and service pressures would be expected to fall within the appropriate ranges.

The MCEA project listing for the recommended watermain infrastructure is provided in ***Section 13.1.***

All proposed water infrastructure is to be designed and constructed in accordance with Ministry of the Environment, Conservation, and Parks (MECP) and City of Ottawa guidelines as part of detailed design associated with *Planning Act* applications with the EUC Phase 3 Area CDP.

10.0 WASTEWATER SERVICING PLAN

10.1 Design Criteria

The City of Ottawa *Sewer Design Guidelines* are to be used to design the EUC Phase 3 Area's wastewater conveyance systems. The criteria employed in the preliminary design of the proposed wastewater system are summarized in ***Table 14.***

Table 14: Wastewater Design Criteria

Design Parameter	Value
Residential - Single Family	3.4p/unit
Residential – Townhome/ Semi	2.7p/unit
Residential – Two Bedroom Stacked Townhome	2.1p/unit
Residential – Apartment	1.8 p/unit
Average Daily Demand	280 L/d/per
Peaking Factor	Harmon's Peaking Factor, where K=0.8
Commercial / Institutional Flows	28,000 L/gross ha/day
Commercial / Institutional Peak Factor	1.5 if contribution area >20%, otherwise 1.0
Light Industrial Flows	35,000 L/gross ha/day
Industrial Peaking Factor	Per Figure in Appendix 4-B, City of Ottawa Guidelines
Infiltration and Inflow Allowance	0.33 L/s/gross ha for all areas
Park Flows	9,300 L/ha/d (75 p/acre per Sewer Guidelines Appendix 4-A)
Park Peaking Factor	1.0
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	200 mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, Technical Bulletins, and recent subdivisions in City of Ottawa.	

The City of Ottawa *Sewer Design Guidelines* state that wherever possible, the design of sanitary sewers should be based on the ultimate sewage flows permitted by the land use zoning. The preferred concept plan and associated unit projections, detailed in ***Section 7.4*** of this report, represent the best available planning information and thus have been used for the purpose of sizing the proposed sanitary sewer network. A summary of the associated design assumptions is provided below:

- **Low Density Residential Areas:** Based on the area and unit count information available from the preferred concept plan, as well as the population densities from the City of Ottawa *Sewer Design Guidelines* (single family – 3.4p/unit, townhomes – 2.7p/unit, back-to-back townhomes – 2.1 p/unit, apartments 1.8p/unit), a population density of 101 pop/gross ha was assigned to all low density residential areas.

- **Medium/Medium-High Density Residential Areas:** Based on the area and unit count information available from the preferred concept plan, as well as, the population densities from the City of Ottawa *Sewer Design Guidelines* (single family – 3.4p/unit, townhomes – 2.7p/unit, apartments 1.8p/unit), a population density of 144 pop/gross ha was assigned to all medium/medium-high density residential areas. Applying the 144 pop/gross ha density to the medium density areas allows for more flexibility in the future design of the medium density blocks.
- **Commercial, Employment and Institutional Areas:** A flow rate of 35,000 L/gross ha/day is to be used for the commercial, employment and institutional areas. This value is more conservative than the 28,000 L/gross ha/day value reported in ***Table 14***, and will reserve capacity for a larger variety of possible detailed land uses in the area. Per the CDP, the employment land use areas will permit traditional industrial uses such as manufacturing, warehousing, distribution, storage, communications, and construction. Per the CDP, the commercial land uses will permit retail, retail food, service and repair uses, recreational and athletic facilities, instructional facilities, animal care establishments and hospitals, municipal service centres, etc. This is consistent with the City of Ottawa's Light Industrial Zone which permits a wide range of low impact light industrial uses, as well as medical facilities, office-type uses in a campus-like industrial park setting, and a variety of complementary uses such as recreational, health and fitness uses and service commercial. Therefore, the light industrial wastewater demand rate of 35,000 L/gross ha/day (per ISTB-2018-01) is considered to best represent the planned land uses for commercial, employment, and institutional land uses proposed in the CDP. The 35,000 L/gross ha/day rate is a reduction to the 50,000 L/ha/day rate used for commercial and institutional areas in the MSU (Stantec, July 2006), the Mer Bleue CDP ISS (IBI Group, April 2006), and some development applications in the area.
- **Mixed-Use Areas:** Commercial flows and residential flows are to be considered for Mixed-Use areas. A commercial flow rate of 28,000 L/gross ha/day is to be applied to half the area of a Mixed-Use area, and the Medium/High Density Residential demand rate of 144 pop/gross ha is to be applied to the remaining half of the area.

Note that with the use of the population densities reported above, the population may differ from the populations reported in ***Section 7.4.*** The populations used for the wastewater servicing design are conservative in nature to allow for the sanitary sewer networks to accommodate potential changes in population and servicing demand estimates at the detailed design level, as site-specific designs advance.

10.2 North West Quadrant Preferred Wastewater Servicing Plan

10.2.1 North West Existing Wastewater Services

The existing 900 mm diameter Forest Valley Trunk (FVT) sanitary sewer on Pagé Road is to the west of the quadrant. Existing developments fronting Innes Road are serviced by 250 mm diameter sanitary sewers draining to the north. An existing development to the southwest of the quadrant is serviced by 250 mm diameter sewers before draining into the FVT. The existing sanitary sewer network is shown in ***Drawing 7***.

10.2.2 North West Wastewater Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service the wastewater flows from the North West quadrant. The MSU (Stantec, July 2006) considered the North West quadrant to be serviced by the FVT sanitary sewer on Pagé Road. The North West quadrant was considered to be part of the 162.94 ha Orléans Business Park and was to connect to the FVT at the intersection of Pagé Road and Silverbirch Street. The MSU's (Stantec, July 2006) peak sanitary flow from the Orléans Business Park is 187.06 L/s, which was stated to be below a reported 'allowance of 255 L/s' (Stantec, 2006) within the FVT sanitary sewer. Excerpts from the MSU (Stantec, July 2006) are provided in ***Appendix D***.

The allowance within the FVT sanitary sewer for the Orléans Business Park is reported as 255 L/s within the MSU (Stantec, July 2006). Within the *Forest Valley Trunk and Orléans Collector Capacity Analysis* (Stantec, October 2003) – which forms an appendix to the MSU (Stantec, July 2006) - the allowance for the Orléans Business Park appears to be 181 L/s at fv07400, the identified outlet for the Orléans Business Park at the intersection of Pagé Road and Silverbirch Street, and accommodates 148 Ha. of land (138 ha industrial, 10 ha residential). In the analysis that follows, 10.3 ha of existing residential land and 1.4 ha of industrial land were removed from the 148 Ha allowance to match the boundary of the Orléans Business Park within the MSU (Stantec, July 2006), in order to isolate the sanitary flow allowance for 3490 Innes Road, the North West quadrant, and external future commercial lands to the north of the quadrant. The resulting peak flow for the 136.3 ha area is 165.2 L/s. This is regarded as the allowance for the Orléans Business Park (3490 Innes Road & NW quadrant) in this MSS. Excerpts from the *Forest Valley Trunk and Orléans Collector Capacity Analysis* (Stantec, October 2003) and allowance calculation are provided in ***Appendix D***.

Note that portions of the external future development lands had previously been expected to drain towards Innes Road and the sanitary sewers on Innes Road have allotted capacity for the wastewater flows for these areas. Based on information provided by City Staff, see ***Appendix D***, it is understood that there is currently a capacity of 133.4 L/s downstream in the 450 mm diameter sanitary sewer on Frank Bender Street. As explained in ***Section 7.3,*** servicing capacity has been reserved in the CDP sewers for the areas and populations shown in ***Drawing 5;*** however, some of these areas may make use of the existing capacity along Innes Road at detailed design depending on land uses, phasing, financial agreements, etc.

More recently, the wastewater servicing strategy for the North West quadrant has been considered within the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017). The overall wastewater servicing strategy in the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017) is consistent with the MSU (Stantec, July 2006), and the updated peak sanitary flow was reported to be 186.14 L/s. See ***Appendix D*** for details.

The adjacent lands to the west of the quadrant are part of an approved development application. Per the *Design Brief for Caivan (Orléans Village) Limited – 3490 Innes Road* (DSEL, May 2018), the outlet to the FVT sanitary sewer for the lands formerly known as the Orléans Business Park has been moved further south, to the intersection of Pagé Road and Nature Trail Crescent. This is due to limited public property in the vicinity of the original alignment and negative social impacts should the City move to acquire the property (especially when an alternative design is readily achievable). A segment of the existing sanitary

sewer on Nature Trail Crescent has been upsized to accommodate the proposed deviation from the MSU (Stantec, July 2006). See ***Appendix D*** for details.

Respecting the trunk sanitary alignment in the approved development application for 3490 Innes Road, the proposed wastewater servicing strategy is to have the sanitary flows from the North West quadrant be routed to the south west, through 3490 Innes Road and connecting to the 900 mm diameter FVT sanitary sewer. Two trunk sanitary sewers varying in size from 200 mm - 600 mm diameter are proposed to service the wastewater flows associated with the preferred concept plan. The proposed sanitary sewer network is shown in ***Drawing 5.*** The alignment generally follows the road network, except for select servicing easements and the alignment of the southern trunk which runs parallel to the Hydro Corridor. The sanitary sewer sizes contemplate the snow dump to remain in place, per City of Ottawa direction. However >30% residual capacity is provided in the downstream sewer network to accommodate any future development within these lands.

At this stage of analysis, only the trunk sanitary sewers within the quadrant are shown. To demonstrate servicing feasibility, the trunk sewer is carried back at minimum possible slopes while accounting for existing infrastructure sizing and possible conflicts with the storm sewer. As the design of the North West quadrant advances, the sanitary sewer network details are subject to change; for example, to be raised where appropriate to offer construction cost savings, provided the conditions in ***Section 14.0*** are met. Minimum cover can be met for the trunk sewer system, on the assumption that the mid-high density blocks will be filled at detailed design according to the type of products proposed (e.g. with or without basements). Springline connections and/or reduced drops across maintenance holes may be proposed as part of detailed design, to assist in minimizing grade raise requirements, provided that the conditions in ***Section 14*** related to minor changes are met.

The peak sanitary flow from the North West quadrant is expected to be 113 L/s. If the snow dump were to be developed in the future, this peak flow estimate may increase to around 120 L/s (***Appendix I***). When including the wastewater flows from the 3490 Innes Road development and the external future development lands to the north, the total peak flow is expected to be 156 L/s, below the determined 165.2 L/s allowance for the Orléans Business Park per the assumptions described below. A 9.24 L/s residual capacity allows for possible future changes to land uses or population densities. The approved land use statistics from the *Design Brief for Caivan (Orléans Village) Limited – 3490 Innes Road* (DSEL, May 2018) were applied to the low density blocks within 3490 Innes Road. The four development blocks near Innes Road within the *Design Brief for Caivan (Orléans Village) Limited – 3490 Innes Road* (DSEL, May 2018) are currently zoned as Development Reserve, but are contemplated for mixed use and mid-high density residential uses per the development application. As such, the EUC Phase 3 Area CDP rate of 144 pop/gross ha was applied to all four development blocks to the north of the quadrant, and a commercial flow rate of 35,000 L/ha/day was overlain on the northernmost two blocks to account for future mixed uses. See ***Appendix D*** for detailed calculations.

As the proposed outlet to the FVT has been moved upstream from fv07400 to fv07700, a HGL analysis has been undertaken to ensure no adverse impacts to existing infrastructure due to the deviation. The *Orléans Village Subdivision/Forest Valley Sanitary Trunk Sewer Hydraulic Analysis Test* (JFSA, July 5, 2018), included in ***Appendix D****,* concludes that there is an increase in modelled HGL downstream (between

fv08100 and fv07500) by up to 15.5 cm due to the relocation of the wastewater flows. However, the simulated HGL elevations are generally up to 70 cm lower than those anticipated in the *Forest Valley Trunk and Orléans Collector Capacity Analysis* (Stantec, October 2003), except for one area that shows a 4 cm surcharge above the pipe obvert and is consistent in the model regardless of whether the flows are directed to fv07400 (per MSU) or fv07700 (per current proposal).

Given that the proposed peak flow is below the 165.2 L/s allowance in the *Forest Valley Trunk and Orléans Collector Capacity Analysis* (Stantec, October 2003) and the corresponding HGL analysis does not cause an increase to the reported HGL downstream, the existing infrastructure is considered to adequately service the proposed wastewater design (although under surcharge, per the original assessment). It is expected that operation requirements for the Forest Valley Pump Station and Forest Valley Trunk will be assessed by the City of Ottawa for the contributing flows described in this MSS, as part of their City-wide growth assessments, infrastructure management, etc.

A summary of the wastewater servicing for the North West quadrant is provided in ***Table 15***.

Table 15: Summary of Wastewater Servicing – North West Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006) and Forest Valley Trunk and Orléans Collector Capacity Analysis (Stantec, October 2003)	Design Brief for Caivan (Orléans Village) Limited – 3490 Innes Road (DSEL, May 2018)	EUC Phase 3 Area CDP MSS (October 2019)
Servicing Strategy	Quadrant to be serviced by the Forest Valley Trunk Sewer at Pagé Road and Silverbirch Street (fv07700) via a network of 250 mm-600 mm diameter sanitary sewers.	Quadrant to be serviced by the Forest Valley Trunk Sewer at Pagé Road and Nature Trail Crescent (fv07400) via a network of 250 mm-675 mm diameter sanitary sewers.	Quadrant to be serviced by the Forest Valley Trunk Sewer at Pagé Road and Nature Trail Crescent (fv07400) via a network of 250 mm-600 mm diameter sanitary sewers.
Total Drainage Area	136.3 ha total to the FVT per the Forest Valley Trunk and Orléans Collector Capacity Analysis (Stantec, October 2003)	161.05 ha total to the FVT, including 3490 Innes Road, NW quadrant, and future commercial blocks to the north of quadrant.	138.69 ha total to the FVT, including 3490 Innes Road, NW quadrant, and future commercial blocks to the north of quadrant.
Residential Peak Flow to the FVT	0 L/s	101.27 L/s	84 L/s*
ICI Peak Flow to the FVT	127.0 L/s	20.33 L/s	27 L/s*

Peak Total Flow to the FVT	165.2 L/s	174.75 L/s	156 L/s*
** To avoid precluding future development of the snow dump, the reported values consider an allowance for future employment lands for the 8.04 Ha area of the existing snow dump*.			

10.2.3 Consideration of Alternative Implementation Details for Servicing Designs

Sanitary sewer routing and sizes have been optimized as part of MSS-level design, to meet City and MECP guidelines. The preferred trunk wastewater design follows the road network, except for easements, where required. The preferred design is an extension of the existing municipal network with a connection point that has been developed in background studies, in order to make efficient use of downstream infrastructure.

Servicing a portion of the employment lands in the North West quadrant by extending the South West quadrant trunk sanitary sewer is a reasonable alternative solution to address the wastewater generated within select employment lands. See ***Figure* 1** and ***Appendix D*** for details. There is a possibility that by having the wastewater from the employment lands drain to the south, the required grade raise in this area could be lower than the grade raise associated with the proposed grading plan. This alternative would require agreements through the Hydro Corridor for the sanitary trunk to convey the employment lands' wastewater flow southward. The existing downstream sanitary infrastructure did not anticipate the employment lands' flow to be conveyed southward (e.g. the proposed alternative sanitary design contributes flows greater than the 45.97 L/s capacity allotted to the stub in the Trailsedge East system per Stantec, August 2018), but the available design sheets indicate that there is capacity in the downstream network to support this alternative design. As such, the alternate routing for the eastern employment lands is proposed to be carried forward as a potential alignment to pursue in detailed design, when additional information is available related to the detailed geotechnical constraints, detailed building types and phasing, etc.

Having one single sanitary trunk versus having two main trunk sewers was considered. See ***Appendix I*** for additional details. Having one main trunk (Trunk 1) allows the North West quadrant to be efficiently served by a fairly direct route from the existing outlet to the furthest parcel. By consolidating flows at the earliest opportunity, the increased trunk sewer size allows for reduced pipe slopes, which assist in minimizing grade raise throughout the site. An additional sanitary sewer along the Hydro Corridor is proposed (Trunk 2), to follow the storm sewer (***Section 11***) and allow for storm and sanitary service for blocks south of Trunk 1 to be directed to the same location, for ease of grading. Having a single trunk along the Hydro Corridor was considered, but introduced a circuitous route that added additional grade raise to the eastern portion of the quadrant.

No other logical and efficient alternative connection points have been advanced for further analysis and evaluation.

10.3 North East Quadrant Preferred Wastewater Servicing Plan

10.3.1 North East Existing Wastewater Services

The existing development to the north of the quadrant is currently being serviced by 250 mm – 525 mm diameter sanitary sewers that run through the North East quadrant, before ultimately connecting to the 525 mm diameter sanitary sewer on Tenth Line Road. The sewer on Tenth Line Road drains towards the Tenth Line Pump Station. The existing sanitary sewer network is shown in ***Drawing 7***.

10.3.2 North East Wastewater Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service this quadrant of the EUC Phase 3 Area. The MSU (Stantec, July 2006) considered the North East quadrant to be serviced by the Tenth Line Pump Station in the ultimate condition, via a trunk collector sewer on Vanguard Drive, draining to a sewer on Tenth Line Road. The sanitary collector sewers considered in the MSU (Stantec, July 2006) can be seen in ***Appendix D***. The Tenth Line Pumping Station has been constructed as generally contemplated within the MSU (Stantec, July 2006).

Per the *Tenth Line Pump Station and Dual Forcemains Preliminary Design Report and Emergency Overflow Memo* (Stantec, June 27, 2005), the North East quadrant was considered to be a part of the Bilberry Creek Industrial Park, which was assigned a peak design flow of 117.4 L/s for a 83.29 Ha area, as shown in ***Appendix D***. This would result in an equivalent peak design flow of 58.47 L/s for the 41.34 Ha of the Bilberry Creek Industrial Park considered in the wastewater design of the North East quadrant.

As part of the ongoing development applications in the North East quadrant, the overall wastewater servicing strategy has been reconsidered. While the servicing strategy is consistent with the MSU (Stantec, July 2006), the *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018) and subsequent reports associated with the development application report residential and industrial land uses for the quadrant as opposed to the solely industrial lands that were previously considered. As such, the North East quadrant was reported to produce peak flows of 66.9 L/s. See excerpted information in ***Appendix D***. This increase in flows results in a downstream sewer to be 3.76% over capacity. Full port backwater valves are proposed in this Stantec 2018 report order to prevent any impacts from the reported surcharge.

The *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018) and subsequent reports also indicate that the existing 250 mm diameter sewer running through the North East quadrant is to make a new connection to the proposed trunk sanitary sewer within Vanguard Drive. At the time the new connection is made, the existing sanitary sewer running through the quadrant is to be decommissioned.

Respecting the development applications within the North East quadrant and the MSU (Stantec, July 2006), the proposed sanitary servicing strategy is to have all flows directed to the existing 375 mm diameter sewer on Vanguard Drive. This includes the wastewater flows from the existing development to the north. The wastewater flow is then to be directed to the Tenth Line Pump Station via the 525 mm diameter sanitary sewer on Tenth Line Road. The proposed sanitary servicing for the North East quadrant is shown in ***Drawing 5***. As per the *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018) and subsequent reports, a section of the existing 250 mm diameter sanitary sewer currently servicing the existing development to the north is proposed to be decommissioned.

At this stage of analysis, only the trunk sanitary sewers within the quadrant are shown. To demonstrate servicing feasibility, the trunk sewer is carried back at minimum possible slopes while accounting for drops at manholes, existing infrastructure sizing, and possible conflicts with crossing other sewers. As the design of the North East quadrant advances, the sanitary sewer network details are subject to change; for example, to be raised where appropriate to offer construction cost savings, provided that the conditions in ***Section 14*** related to minor changes are met.

As shown in the design sheet in ***Appendix D***, the anticipated peak sanitary flow from the quadrant is 61.81 L/s utilizing the demand criteria in ***Table 14*** (37.20 L/s + 24.61 L/s)***.*** Population estimates from the *Site Servicing Report* (***Table 16)*** were applied, as it resulted in a more conservative population count compared to using the population densities described in ***Section 10.1*** of this report. The anticipated flow is approximately 106% of the 58.47 L/s flow determined based on the *Tenth Line Pump Station and Dual Forcemains Preliminary Design Report and Emergency Overflow Memo* (Stantec, June 27, 2005). However, the anticipated peak flow is 92% of the 66.9 L/s flow reported in the *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018), which concludes there is capacity in the downstream infrastructure for the 66.9 L/s peak flow.

Furthermore, based on information provided by City of Ottawa staff (see ***Appendix D*** for details), it is understood that there is 175.5 L/s of residual capacity within the 525 mm diameter sanitary sewer on Vanguard Drive. It is assumed that the information provided by the City has accounted for any constraining pinch points downstream. Given that the North East quadrant is believed to be the only area tributary to the Vanguard Drive sanitary sewer that is yet to be developed, meaning no future flow allowances are required, it is concluded that there is adequate capacity in the downstream infrastructure for the 61.81 L/s predicted peak flow. Note that the portion of the North East quadrant's sanitary drainage area that has been constructed is assumed to have been accounted for in the City's modelling. Therefore, there is likely to be greater residual capacity that the 175.5 L/s reported, as this flow contribution forms part of the predicted 61.81 L/s flow. A more detailed analysis of the downstream sanitary sewers will be required as designs within the North East quadrant progress.

As such, it is concluded that the existing infrastructure can adequately service the proposed wastewater design.

A summary of the wastewater servicing for the North East quadrant is provided in ***Table 16.***

Table 16: Summary of Wastewater Servicing – North East Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006) and Tenth Line Pump Station and Dual Forcemains	Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision (Stantec, April 12, 2018) and Servicing Options Report for Blacksheep Developments 2159 Mer	EUC Phase 3 Area CDP MSS (October 2019)

	Preliminary Design Report and Emergency Overflow Memo (Stantec, June 27, 2005).	Bleue Road (DSEL, December 2017)	
Servicing Strategy	Quadrant to be serviced by the Tenth Line Pump Station and the trunk sewer on Tenth Line Road via the trunk sewer on Vanguard Drive.	Quadrant to be serviced by the Tenth Line Pump Station and the 525 mm diameter trunk sewer on Tenth Line Road via the 300 mm-525 mm diameter trunk sewer on Vanguard Drive.	Quadrant to be serviced by the Tenth Line Pump Station and the 525 mm diameter trunk sewer on Tenth Line Road via the 250 mm-525 mm diameter trunk sewer on Vanguard Drive.
Total Drainage Area	41.34 Ha (Taken from 83.29 Ha of Bilberry Creek Industrial Park)	41.52 Ha	41.34 Ha
Residential Peak Flow	0 L/s	19.2 L/s	24.61 L/s
ICI Peak Flow	46.90 L/s	34.10 L/s	23.56 L/s
Peak Total Flow to Ex. 375mm diameter sewer on Vanguard Drive	58.47 L/s	66.9 L/s	61.81 L/s

10.3.3 Consideration of Alternative Implementation Details for Servicing Designs

Wastewater sewer sizing and routing were reviewed as part of MSS-level design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area and the predicted performance, no other logical or efficient alternative designs were advanced for additional analysis and evaluation.

10.4 South West Quadrant Preferred Wastewater Servicing Plan

10.4.1 South West Existing Wastewater Services

The existing development to the southwest of the quadrant is currently being serviced by a 200 mm – 600 mm diameter sanitary sewer network that runs southward and drains into the 600 mm diameter sanitary sewer on Renaud Road. The Renaud Road sanitary sewer ultimately outlets to the Forest Valley Pump Station to the west. The existing sanitary sewer network is shown in ***Drawing 7***.

10.4.2 South West Wastewater Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service the wastewater of the South West quadrant. The South West quadrant is tributary to the Forest Valley Pump Station. The MSU (Stantec, July 2006) considered the South West quadrant to be serviced by a 375 mm diameter trunk sanitary sewer to the south of the quadrant, running westward before ultimately draining into a 600 mm diameter sewer on Renaud Road (formerly named Fourth Line Road). The sanitary collector sewers considered in the MSU

(Stantec, July 2006) can be seen in ***Appendix D***. A peak sanitary flow of 29.40 L/s was considered within the MSU (Stantec, July 2006). Note that no commercial flows were applied to the quadrant within the MSU (Stantec, July 2006), although the area was contemplated as mixed-use.

More recently the wastewater servicing of the South West quadrant and its surrounding area has been considered within the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017). See ***Appendix D*** for excerpts from the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017).

Since the completion of the MSU (Stantec, July 2006), the wastewater servicing of the South West quadrant has been considered during the construction of downstream infrastructure. The *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015) includes the wastewater drainage for the portion of the South West quadrant that is east of Fern Casey Street. Per the *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015), the downstream wastewater infrastructure anticipated a total peak flow allowance of 45.97 L/s at the South West quadrant's outlet, MH35A. See ***Appendix D***, for sanitary drainage information and flow allowance calculations. It can be concluded that the capacity in the constructed downstream infrastructure exceeds the capacity that was considered within the MSU (Stantec, July 2006).

The wastewater servicing for the South West quadrant has also been considered as part of an approved development application neighbouring the South West quadrant. Per the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017), an additional 2.96 ha area drains to the existing MH35A along with the portion of the South West quadrant east of Fern Casey Street. The Trailsedge East lands are undergoing detailed design and construction. Per the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August 2018) and subsequent reports associated with the development application, the additional area has been refined to a 1.92 ha area with a population of 105 persons draining to the existing MH35A along with the portion of the South West quadrant that is east of Fern Casey Street. Note that the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August 2018) proposes to accommodate the wastewater flows from the South West quadrant through 2 inlet locations. All wastewater flows from the South West quadrant east of Fern Casey Street are still proposed to be directed towards existing manhole MH35A, despite the multiple inlet locations. See ***Appendix D*** for details.

The *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015) includes the wastewater drainage for the portion of the South West quadrant west of Fern Casey Street. A peak flow allowance of 4.07 L/s at existing MH37A was considered in the constructed wastewater infrastructure for the portion of the South West quadrant that is west of Fern Casey Street. See ***Appendix D*** for sanitary drainage information and flow allowance calculations.

Respecting the MSU (Stantec, July 2006), existing wastewater infrastructure and development applications within the South East quadrant, the proposed sanitary servicing strategy is to have all flows from the quadrant drain to the Forest Valley Pump Station via the existing 600 mm diameter sanitary sewer on Renaud Road. The proposed sanitary sewer network is shown in ***Drawing 5***. A sewer is proposed to cross Brian Coburn Boulevard at an existing gap in underground services – coordination will be required for work in the ROW, including utility coordination.

At this stage of analysis, only the trunk sanitary sewer within the quadrant is shown. To demonstrate servicing feasibility, the trunk sewer is carried back at minimum possible slopes while accounting for drops at manholes, existing infrastructure sizing, and possible conflicts with crossing other sewers. As the design of the South West quadrant advances, the sanitary sewer network details are subject to change; for example, to be raised where appropriate to offer construction cost savings, provided that the conditions in ***Section 14*** related to minor changes are met. Springline connections and/or reduced drops across maintenance holes may be proposed as part of detailed design, to assist in minimizing grade raise requirements, provided that the conditions in ***Section 14*** related to minor changes are met.

As shown in the design sheet included in ***Appendix D***, the anticipated peak sanitary flow from the portion of the quadrant east of Fern Casey Street is 38.08 L/s. Including the additional 1.92 ha and population of 105 as per *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August 2018), the total peak sanitary flow to existing MH35A is 39.66 L/s. This represents roughly 86% of the 45.97 L/s allowance reported within the *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015). Therefore, the existing downstream wastewater infrastructure is demonstrated to adequately service the portion of the South West quadrant east of Fern Casey Street.

Please note that consistent with the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017), the wastewater flows from the South West quadrant east of Fern Casey Street are directed towards one outlet in this MSS. Outlets and routing alternatives may be refined as the design process advances, based on the constructed downstream infrastructure.

The anticipated peak sanitary flow from the portion of the South West quadrant that is west of Fern Casey Street is 7.03 L/s, which is larger than the 4.07 L/s allowance considered in the *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015). The primary reason for the increase in wastewater flows is a proposed increase of the population from 184 to 532 based on the high-level demand estimate assumptions adopted in this MSS. A check of the downstream sanitary sewers considered in the *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015) shows that the constraining segment (MH160A – MH17A) still has 22% residual capacity with the addition of the proposed population increase of 348 persons. See ***Appendix D*** for detailed calculations. Therefore it is concluded that the existing downstream wastewater infrastructure can adequately service the portion of the South West quadrant that is west of Fern Casey Street. It is expected that operational requirements for the downstream Forest Valley Pump Station and Forest Valley Trunk will be assessed by the City of Ottawa for the contributing flows described in this MSS, as part of their City-wide growth assessments, infrastructure management, etc.

A summary of the wastewater servicing for the South West quadrant is provided in ***Table 17***.

Table 17: Summary of Wastewater Servicing – South West Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006)	Design Brief for the Trails Edge West Richcraft Group of Companies (DSEL, January 26, 2015) and Design Brief – Minto Trailsedge Phase II (IBI Group, May 2015)	EUC Phase 3 Area CDP MSS (October 2019)
Servicing Strategy	Quadrant to be serviced by the Forest Valley Pump Station and the 600 mm diameter sewer on Renaud Road via the sanitary sewer network to the south west.	Quadrant to be serviced by the Forest Valley Pump Station and the existing 600 mm diameter sewer on Renaud Road via the existing sanitary sewer network to the south west.	Quadrant to be serviced by the Forest Valley Pump Station and the existing 600 mm diameter sewer on Renaud Road via the existing sanitary sewer network to the south west.
Total Drainage Area to Ex MH37A	N/A	3.84 ha.	3.69 ha.
Residential Peak Flow to Ex MH37A	N/A	2.98 L/s	5.81 L/s.
ICI Peak Flow to Ex MH37A	N/A	0 L/s.	0 L/s.
Peak Total Flow to Ex MH37A	N/A	4.07 L/s.	7.03 L/s.
Total Drainage Area to Ex MH35A	N/A	42.80 ha.	29.54 ha. (31.46 ha including future area to the south).
Residential Peak Flow to Ex MH35A	N/A	31.97 L/s	23.41 L/s. (24.36 L/s including future area to the south).
ICI Peak Flow to Ex MH35A	N/A	2.01 L/s.	4.92 L/s.
Peak Total Flow to Ex MH35A	N/A	45.97 L/s.	38.08 L/s. (39.66 L/s including future area to the south).

10.4.3 Consideration of Alternative Implementation Details for Servicing Designs

Wastewater sewer sizing and routing were reviewed as part of MSS-level design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area and the predicted performance, no other logical or efficient alternative designs were advanced for additional analysis and evaluation.

10.5 South East Quadrant Preferred Wastewater Servicing Plan

10.5.1 South East Existing Wastewater Services

An existing residential development to the east of the quadrant has brought a 300 mm diameter sanitary sewer stub to the eastern property boundary. This stub connects to the 375 mm diameter sanitary sewer within Gerry Lalonde Drive, ultimately running to the Tenth Line Pump Station via an existing sanitary sewer network shown in ***Drawing 7***.

The portion of the South East quadrant designated as Medium Density has already been constructed and is being serviced by the 300 mm diameter sanitary sewer stub mentioned above.

10.5.2 South East Wastewater Design

The Mer Bleue CDP ISS (IBI Group, April 2006) reviewed the required infrastructure to service this portion of the EUC Phase 3 Area. The South East quadrant is tributary to the Tenth Line Pump Station.

The Mer Bleue CDP ISS (IBI, April 2006) considered the South East quadrant to be serviced by two outlets into the trunk sanitary sewer, east of the quadrant on Gerry Lalonde Drive. At the time of the Mer Bleue CDP ISS (IBI, April 2006), the lands were zoned to allow mixed use residential and commercial development. The sanitary drainage plan from the Mer Bleue CDP ISS (IBI, April 2006) can be seen in ***Appendix D***. Based on the drainage information and design parameters from the Mer Bleue CDP ISS (IBI, April 2006), the allowable sanitary peak flows from the South East quadrant were determined to be 7.48 L/s and 11.18 L/s to the northern and southern outlets to Gerry Lalonde Drive, respectively. Detailed calculations for the peak flow allowances are provided in ***Appendix D***.

As part of the ongoing development applications in the South East quadrant, the overall wastewater servicing strategy has been modified. Key changes include the rezoning of 9 ha from mixed use to institutional and to have all sanitary flows directed to the southern outlet on Gerry Lalonde Drive, as opposed to the two outlets described in the Mer Bleue CDP ISS (IBI, April 2006). Based on the information available from the *Orléans Family Health Hub Stormwater Management & Servicing Report* (Exp., April 5, 2018), the *Taggart Group of Companies Infrastructure Servicing Brief* (Exp., November 20, 2013), and subsequent reports associated with development applications, the anticipated total flow from the South East quadrant was calculated to be 14.52 L/s. See ***Appendix D*** for details.

Respecting the development applications within the South East quadrant, the proposed sanitary servicing strategy is to have all flows from the quadrant drain to the sewer on Gerry Lalonde Drive via one outlet (the existing 300 mm diameter stub). From Gerry Lalonde Drive, the flow will make its way to the Tenth Line Pump Station via the existing sanitary sewer network shown in ***Drawing 5***.

At this stage of analysis, only the trunk sanitary sewer within the quadrant is shown. To demonstrate servicing feasibility, the trunk sewer is carried back at minimum possible slopes while accounting for drops at manholes, existing infrastructure sizing and possible conflicts with crossing other sewers. As design of the parcels comprising the South East quadrant advance, the sanitary sewer network details are subject to change to address construction cost efficiencies, etc.

As shown in the design sheet included in ***Appendix D***, the anticipated peak sanitary flow from the quadrant using the high-level demand estimates adopted in this MSS is 11.83 L/s. Note that since the Medium Density portion of the South East quadrant has been constructed, the population of 227 has been carried forward into the proposed wastewater design. Site details are provided in ***Appendix D***.

The peak flow of 11.83 L/s is roughly 106% of the 11.18 L/s allowance in the southern outlet from the Mer Bleue CDP ISS (IBI, April 2006). While the anticipated peak flow from the quadrant is above the southern allowance, the anticipated 11.83 L/s is below the cumulative quadrant peak flow allowance of 18.66 L/s to the northern and southern outlets combined. The anticipated peak flow is only 64% of the allowance contemplated within the Mer Bleue CDP ISS (IBI, April 2006). The design sheets from the Mer Bleue CDP ISS (IBI, April 2006), provided in ***Appendix D***, indicate that there is a residual capacity of 58.11 L/s between the quadrants' southern and northern outlets (from MH 101 to MH 102). As the quadrants' peak flow is below the cumulative allowance of 18.66 L/s, and there is residual capacity to relocate all of the quadrants' wastewater flow to the southern outlet, it is demonstrated that the existing infrastructure can adequately service the proposed wastewater design.

A summary of the wastewater servicing for the South East quadrant is provided in ***Table 18***. The site-specific development application suggests a higher sanitary outflow than the assumptions in this MSS. It is expected that the site-specific sanitary plan would be subject to detailed review through the development application process, and any refined analysis and demonstration of downstream capacity refined at the site-specific level would govern future construction and operation.

Table 18: Summary of Wastewater Servicing – South East Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Mer Bleue CDP ISS (IBI, April 2006).	Orléans Family Health Hub Stormwater Management & Servicing Report (Exp, April 5, 2018) and Taggart Group of Companies Infrastructure Servicing Brief (Exp, November 20, 2013).	EUC Phase 3 Area CDP MSS (October 2019)
Servicing Strategy	Quadrant to be serviced by the Tenth Line Pump Station and the trunk sewer network to the east via two outlets to the 375 mm diameter trunk on Gerry Lalonde Drive.	Quadrant to be serviced by the Tenth Line Pump Station and the existing sewer network to the east via the 300 mm diameter stub on quadrants eastern boundary.	Quadrant to be serviced by the Tenth Line Pump Station and the existing sewer network to the east via the 300 mm diameter stub on quadrants eastern boundary.
Total Drainage Area	12.3 Ha total (5.05 Ha to north outlet, 7.25 Ha to south outlet).	10.35 Ha.	10.69 Ha.
Residential Peak Flow	3.78 L/s to north outlet, 5.28 L/s to south outlet.	3.68 L/s	2.57 L/s.
ICI Peak Flow	2.3 L/s to north outlet, 3.9 L/s to south outlet.	8.0 L/s.	5.73 L/s.

Peak Total Flow to Ex. 300mm diameter stub	11.18 L/s (additional 7.48 L/s from the site directed further north on Gerry Lalonde Drive).	14.52 L/s.	11.83 L/s.

10.5.3 Consideration of Alternative Implementation Details for Servicing Designs

Wastewater sewer sizing and routing were reviewed as part of MSS-level design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area and the predicted performance, no other logical or efficient alternative designs were advanced for additional analysis and evaluation.

10.6 Commitments for Detailed Design

The wastewater conveyance systems will be designed to support the phased developments within the EUC Phase 3 CDP area. All proposed sanitary sewer infrastructure is to be designed in accordance with the City of Ottawa Sewer Design Guidelines and all MECP guidelines.

The proposed gravity sewer conveyance systems are shown to generally follow the proposed road network, with the exception of select conceptual servicing easements and a trunk sewer that is to run parallel to the Hydro Corridor. Note that as the road network is conceptual in nature, the alignments of the trunk sanitary sewers are also subject to change. Easements may be required in order to provide efficient servicing to address City and MECP guidelines.

During design of the developments within the EUC Phase 3 Area:

- Demands will be updated and distribution refined, once the more detailed development information is available;
- Design parameters according to City of Ottawa Sewer Design Guidelines will be used;
- Local sanitary sewer sizing will need to be evaluated at the subdivision approval stage; and
- Capacity in downstream infrastructure will be confirmed through sanitary sewer network modelling, as-builts, and/or sanitary design sheet information.

10.7 Wastewater Servicing Conclusion

The design of the sanitary sewer network is in accordance with the City of Ottawa Sewer Design Guidelines. The western quadrants are tributary to the Forest Valley Pump Station and Forest Valley Trunk sanitary sewer. The South West quadrant is to be directed to the Forest Valley Pump Station via existing downstream infrastructure. Adequate capacity has been reserved in the downstream infrastructure for the South West quadrant's wastewater flows. The North West quadrant is to outlet into the Forest Valley Trunk through the approved sanitary sewers being constructed to the west. The quadrants wastewater flows are to outlet into the Forest Valley Trunk further upstream than the MSU (Stantec, July 2006) considered. Per the *Orléans Village Subdivision/Forest Valley Sanitary Trunk Sewer Hydraulic Analysis Test* (JFSA, July 5, 2018), the proposed deviation from the MSU (Stantec, July 2006) causes a minor increase in modelled

downstream HGL, however the modelled HGL elevation is generally lower than originally anticipated within the MSU (Stantec, July 2006). It can be concluded that the downstream infrastructure can adequately service the North West quadrant.

The eastern quadrants are tributary to the Tenth Line Pump Station via Tenth Line Road. Both the North East and South East quadrant's wastewater flow is to be directed to the Tenth Line Pump station via existing downstream infrastructure. Adequate capacity has been reserved in the downstream infrastructure for the South East quadrant's wastewater flows. Detailed analysis of the downstream sanitary sewers will be required as designs within the North East quadrant progress.

The MCEA project listing for the recommended wastewater infrastructure is provided in ***Section 13.1.***

All proposed sanitary sewer infrastructure is to be designed and constructed in accordance with the City of Ottawa Sewer Design Guidelines and MECP guidelines as part of detailed design associated with *Planning Act* applications within the EUC Phase 3 Area CDP study area.

11.0 STORMWATER MANAGEMENT AND STORM CONVEYANCE PLAN

11.1 Design Criteria

Table 19 summarizes the parameters to be used to design the stormwater conveyance system. The parameters are based on City of Ottawa Sewer Design Guidelines.

Table 19: Storm Sewer Design Criteria

Design Parameter	Value
Minimum Minor System Design Return Period	1:2 year (PIEDTB-2016-01) (local) or 1:5 year (collector) or 1:10 year (arterial)
Major System Design Return Period	1:100 year
Intensity Duration Frequency Curve (IDF) 2-year storm event: A = 732.951; B = 6.199; C = 0.810 5-year storm event: A = 998.071; B = 6.053; C = 0.814	$i = \frac{A}{(t_c + B)^C}$
Minimum Time of Concentration	10 minutes
Rational Method	$Q = CiA$
Storm sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Runoff coefficient for paved and roof areas	0.9
Runoff coefficient for landscaped areas	0.2
Minimum Sewer Size	250 mm diameter
Minimum Manning's 'n' for pipe flow	0.013
Minimum Depth of Cover	2.5 m from crown of sewer to grade at preliminary design, to account for low points in road during future detailed design
Minimum Full Flowing Velocity	0.8 m/s
Maximum Full Flowing Velocity	6.0 m/s (where velocities in excess of 3.0 m/s are proposed, provision shall be made to protect against displacement of sewers by sudden movement)
Clearance from 100-Year Hydraulic Grade Line to Building Opening (USF)	0.30 m
Max. Allowable Flow Depth on Municipal Roads	35 cm above gutter (PIEDTB-2016-01) (local, collector, arterial) No barrier curb overtopping (arterial)
Extent of Major System	To be contained within the municipal right-of-way or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope and must remain below the lowest building opening during the stress test event (100-year + 20%) and 15 cm vertical clearance is maintained between spill elevation on the street and the ground elevation at the nearest building envelope (PIEDTB-2016-01)
Stormwater Management Model	DDSWMM (release 2.1), SWMHYMO (v. 5.02) and XPSWMM (v. 10)
Model Parameters	Fo = 76.2 mm/hr, Fc = 13.2 mm/hr, DCAY = 4.14/hr, D.Stor.Imp. = 1.57 mm, D.Stor.Per. = 4.67 mm
Imperviousness	Based on runoff coefficient (C) where

	Percent Imperviousness = (C - 0.2) / 0.7 x 100%.
Design Storms	Chicago 3-hour Design Storms and 24-hour SCS Type II Design Storms. Maximum intensity averaged over 10 minutes.
Historical Events	July 1st, 1979, August 4th, 1988 and August 8th, 1996
Climate Change Street Test	20% increase in the 100-year, 3-hour Chicago storm
Extracted from City of Ottawa Sewer Design Guidelines, October 2012, and Technical Bulletins	

The following key City standards will be required for stormwater management within the subject lands and conveyance to the proposed stormwater management ponds, among other requirements:

- For less frequent storms (i.e. larger than the minimum level of service), the minor system sewer capture will be restricted with the use of inlet control devices to prevent excessive hydraulic surcharges;
- Under full flow conditions, the allowable velocity in storm sewers is to be no less than 0.80 m/s
- When catchbasins are installed in rear yards, safe overland flow routes are to be provided to allow the release of excess flows from such areas. A minimum of 30 cm of vertical clearance is required between the rear yard spill elevation and the ground elevation at the adjacent building envelope; and,
- The product of the maximum flow depths on streets and maximum flow velocity must be less than 0.60 m^2/s on all roads.

The following additional grading criteria and guidelines will be applied to the detailed grading designs as per City of Ottawa Guidelines:

- Driveway slopes will have a maximum slope of 6%;
- Slope in grassed areas will be between 2% and 5%;
- Grades in excess of 7% will require terracing to a maximum of a 3:1 slope;
- Swales are to be 0.15 m deep with 3:1 side slopes unless otherwise indicated; and,
- Perforated pipe will be required for drainage swales if they are less than 1.5% in slope and will be used to interconnect rear yard catchbasins where possible in order to increase infiltration.

Conservative average runoff coefficients (C) values have been applied according to the conceptual land uses and the amount of impervious area in each catchment:

- **Low Density Residential Areas:** The CDP designates these areas for detached dwellings, semi-detached dwellings, linked-detached dwellings, townhomes, rear-lane townhomes and back-to-back townhomes. These areas have been assigned an average runoff coefficient of 0.70 to account for impervious surfaces (driveways, roads, roofs) and pervious areas (backyards). This C value is representative of Richcraft's developments in other parts of Ottawa.
- **Medium Density and Med-High Density Residential Areas:** The CDP designates these areas for townhomes, rear-lane townhomes, back-to-back townhomes, stacked townhomes back-to-

back stacked townhomes, low-rise and mid-rise apartment buildings. These areas have conservatively been expected to have a small amount of pervious surfaces. As such, an average runoff coefficient of 0.8 has been assigned. These C values are representative of recently approved studies of a similar scope to this MSS.

- **Employment Areas:** These areas have conservatively been expected to have little significant pervious surfaces (backyards, landscaping). As such, an average runoff coefficient of 0.8 has been assigned.
- **Institutional Areas** This area has conservatively been expected to have no significant pervious surfaces (backyards, landscaping). As such, an average runoff coefficient of 0.9 has been assigned.
- **Commercial Areas:** The CDP designates these areas for a wide variety of uses such as restaurants, medical facilities, higher density residential development. As such, these areas have conservatively been expected to have little to no significant pervious surfaces (landscaping). As such, an average runoff coefficient of 0.9 has been assigned.
- **Mixed-Use Blocks:** These blocks are expected to have less pervious areas (landscaped areas and backyards) than the low and medium density blocks and have been assigned an average runoff coefficient of 0.85.
- **Park Blocks:** These blocks have been assigned an average runoff coefficient of 0.4, associated with maintained grass lawns.

MECP has indicated a priority to prepare communities for the costs and impacts of climate change, including lowering the risk of basement flooding. As part of this MSS, the City of Ottawa's climate change stress test (100-year 3-hour Chicago storm plus 20%) has been applied in the sections that follow, to confirm that no basement flooding is expected in this test condition.

11.2 North West Quadrant Preferred Stormwater Management Plan

11.2.1 North West Existing Stormwater Drainage

The quadrant is tributary to Mud Creek, which ultimately outlets to Green's Creek, then the Ottawa River.

There is a small stormwater management facility located within the CDP study area, behind an existing Canadian Tire store. Per the *First Innes Shopping Centres, Stormwater Management Report - Phase 3 Update* (Stantec, February 2006), the stormwater management facility is a permanent surcharge basin at the upstream end of the shopping center's storm sewer system. The pond is required due to a restrictive release rate for the downstream sewers on Frank Bender Street. The 0.3 ha stormwater management facility is to be left in place as-is.

A temporary stormwater management pond was previously constructed within the North West quadrant to support the commercial development at 3730 Innes Road. Per the *Trinity Development – Innes / Belcourt Stormwater Management System,* (IBI Group, 2009) the facility directs treated stormwater along an open ditch towards the existing EUC Pond 1 SWM facility.

A snow disposal facility was constructed by the City of Ottawa at 2170 Innes Road within the North West quadrant. This facility directs treated snow melt water from the onsite facility to the North Cell of the EUC Pond 1 via a 150 mm diameter forcemain installed within the Hydro Corridor. The existing stormwater management infrastructure surrounding the North West quadrant can be seen in ***Drawing 7***. Brian Coburn Boulevard has been constructed complete with a piped sewer network discharging to the South Main Cell of EUC Pond 1 (first receiving treatment by an OGS), and a cut off ditch on the north side, directing flows to the North Main Cell.

11.2.2 North West Minor System Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service the North West quadrant of the EUC Phase 3 Area. The intended storm outlet for the quadrant is the North Forebay of EUC Pond 1. EUC Pond 1 was designed in 2008 and built to service a business park development, however previous studies have indicated that the pond would require expansion/modification in order to service the original drainage area per current MECP and City of Ottawa guidelines.

The MSU (Stantec, July 2006) considered the North West quadrant to be serviced by two trunk storm sewers ranging in diameter from 1500 mm to 2400x3000 mm. The trunk sewers were to discharge into the North Forebay of the EUC Pond 1. A 5-year capture was used for all development lands and local roads, while a 10-year capture was applied to arterial roads, namely Mer Bleue Road to the east of the quadrant. A rational method peak flow of 20,967.2 L/s was anticipated for the 169.3 ha area of the lands, then known as the Orléans Business Park (including 3490 Innes Road, the NW quadrant, and various abutting lands), considered draining to EUC Pond 1 North Forebay. A runoff coefficient of 0.75 was used for the commercial/industrial land use and 0.8 was used for the roads. Details of the MSU (Stantec, July 2006) minor system can be found in ***Appendix E***.

Note that per the MSU (Stantec, July 2006) standing water was anticipated in the storm sewer due to grade raise restrictions and depth of cover requirements. The MSU (Stantec, July 2006) recommends that the grade raise restrictions be further analyzed, along with deviating from the sewer depth of cover requirements to allow for the storm sewer to be raised in the future.

More recently, the North West quadrant was considered as part of the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017). The minor system design from the MSU (Stantec, July 2006) was refined based on updated road networks and land uses. Deviations from the EUC Pond 1 drainage boundary were reported, mainly involving the commercial lands to the north of the North West quadrant. An average runoff coefficient of 0.83 was used for the entirety of the Orléans Business Park, based on including additional impervious surfaces to the runoff coefficient of 0.8 that was used in the MSU (Stantec, July 2006), consistent with similar developments. A rational method minor system peak flow of 20,530 L/s was anticipated for the 171.18 ha commercial area of the Orléans Business Park considered draining to a proposed (undefined) North Forebay expansion of the EUC Pond 1. As shown in **Appendix E**, the Orléans Business Park, which includes the North West quadrant, was reported to be serviced by trunk storm sewers ranging in diameter from 1200 mm to 3000x3000 mm. 5-year capture was used for all development lands and local roads. Per the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017), standing water was considered in the storm sewers, which is consistent with the MSU (Stantec, July 2006).

The adjacent lands to the west of the quadrant are part of an approved development application. Per the *Design Brief for Caivan (Orléans Village) Limited – 3490 Innes Road* (DSEL, May 2018), the minor system for 3490 Innes Road has been designed so as to be independent from the minor system of the North West quadrant, producing a rational method peak flow of 3,820 L/s to EUC Pond 1. This is a deviation from the background studies where the entirety of the Orléans Business Park was to drain into one outlet to the EUC Pond 1. See ***Appendix E*** for details.

The minor system for the North West quadrant is proposed to be directed to the EUC Pond 1 via two trunk storm sewers. Respecting the *Design Brief for Caivan (Orléans Village) Limited – 3490 Innes Road* (DSEL, May 2018), the proposed minor storm sewer system is separate from the minor system for 3490 Innes Road. The 3490 Innes Road minor system is proposed to be rerouted to outlet into the proposed expansion of the North Forebay of EUC Pond 1. The proposed pond expansion is detailed in ***Section 11.2.5***. The existing temporary stormwater management facility for 3730 Innes Road is proposed to be decommissioned and flows are to be captured by the proposed minor system via a cut-off swale near the Innes Park Woods.

The Rational Method, with design criteria described in ***Section 11.1,*** was employed to size the storm sewer to accommodate all minor flows. The North West quadrant is to be serviced by trunk storm sewers ranging in diameter from 525 mm to 2700 mm. A 3000 mm diameter maximum sewer size has been considered, based on City comments on similar recently-approved servicing studies of similar scope. Box pipe has not been proposed, given City concerns regarding maintenance of non-circular pipes. The maximum diameter storm sewer in a local 18m ROW is 2700mm, near EUC Pond 1. An example cross section is shown in ***Figure 5***, and Paterson Group has confirmed that this pipe can be constructed and maintained as proposed (***Appendix G***).

The trunk storm sewer network largely follows the road network, except for select servicing easements and the proposed southern trunk sewer that runs parallel to the Hydro Corridor. Note that at this stage of design, only the trunk storm sewers within the quadrant have been designed. The quadrant is expected to be serviced by a network of local sewers draining to the trunk sewers shown. As design of the parcels comprising the North West quadrant advance, the storm sewer network details are subject to change, provided that the conditions in ***Section 14*** related to minor changes are met; for example, to alter stormwater sewer profiles for more efficient earthworks programs, etc. To demonstrate servicing feasibility, the trunk sewers have been carried back from the permanent pool of the pond, accounting for existing infrastructure sizing, possible conflicts with the proposed sanitary sewer, and City Standards. The proposed trunk sewer network and storm trunk profiles are shown in ***Drawing 4*** and ***Figure 1****,* respectively. Springline connections may be proposed as part of detailed design, provided that the conditions in ***Section 14*** related to minor changes are met, to assist in keeping road and lot grades as low as possible given the grade raise restrictions for the EUC Phase 3 Area CDP.

Per current City operating preferences, standing water is to be avoided in the storm sewer network where possible. As such, the opportunity to eliminate standing water from the storm sewer was explored and the system was raised from the background studies to eliminate standing water in the trunk storm sewer network. This does not appreciably change the grading design in the North West quadrant, as cover over the sanitary sewer system generally governs the grading design. If standing water is encountered as part of future detailed designs associated with *Planning Act* approvals, it would be expected that updated

modelling and special maintenance provisions could be explored to mitigate against negative impacts of standing water.

Two-year capture was assumed for all local roads and development lands with exception of the medium density residential, mid-high density residential, and park lands where 5-year capture was considered. Five-year capture was used for collector roads and 10-year capture was used for arterial roads in order to adhere to City Standards. A capture rate of 85 L/s/ha was used for one of the external existing commercial blocks, consistent with background information for the block. See ***Appendix E*** for additional details. 100-year capture was applied to the Provincially Significant Habitat bordering the Innes Park Woods, based on recommendations from Niblett Environmental Associates that drainage patterns be maintained (e.g. no additional ponding). Due to the species present in this area, Niblett Environmental Associates has recommended that the hydroperiod is to be maintained to existing conditions.

As shown in ***Appendix E***, the rational method peak minor system flow for the North West quadrant and external commercial lands is 11,844 L/s to one forebay and 2,260 L/s to the other. The incoming flows from 3790 Innes Road are to be conveyed by a separate pipe to the same forebay that accepts the 2,260 L/s from the North West quadrant.

The proposed EUC Pond 1 expansion described within this MSS (***Section 11.2.5***) was designed to adequately service the minor flows from the North West quadrant and 3490 Innes Road. Therefore, the minor system flows for the North West quadrant can be adequately serviced by the proposed EUC Pond 1 North Cell expansion.

11.2.3 North West Hydraulic Grade Line Analysis

A Hydraulic Grade Line analysis was completed for the North West quadrant. The suitability of the proposed trunk sewer network was analyzed in the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019), provided in ***Appendix E***. The simulated 100-year HGL results through the proposed trunk storm sewer network have been analyzed for suitability with the proposed road grades and anticipated underside of footing elevations, estimated to be 2.1 m below ground level at this preliminary design stage.

The analysis was simulated with the 100-year 3-hour Chicago storm, 100-year 24-hour SCS Type II storm and July 1979, August 1988 and August 1996 historical events. The results indicated that the quadrant is serviceable per the preferred design as a freeboard of 0.3 m between the hydraulic gradeline and the estimated underside of footing is provided for the 100-year storms and a freeboard of 0 m has been provided for the historical events and the 100-year storm + 20% climate change stress test . As noted earlier, the storm sewer design is expected to change at detailed design (e.g. to incorporate local sewers, to minimize earthworks costs, etc.), and an updated analysis will be required in conformance with all City of Ottawa and MECP guidelines.

11.2.4 North West Major System & Grading Design

Per the MSU (Stantec, July 2006), the majority of the North West quadrant was to be directed to EUC Pond 1, with a small portion of Vanguard Drive Extension to be directed towards Mer Bleue Road. The section

routed toward Mer Bleue was then proposed to flow along Mer Bleue Road and through the Hydro Corridor to the EUC Pond 1. Routing for the remaining area was shown following the proposed road network and minor system towards the EUC Pond 1. Road grade elevations were reported as 0-0.6 m higher than the existing ground. Details are found in ***Appendix E***.

The *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017), demonstrates the major flow is to be stored within the proposed road network, then conveyed to the EUC Pond 1 consistent with the MSU (Stantec, July 2006). Road grade elevations were reported as 0-3 m higher than the existing ground, higher than the 0.6 m grade raise restriction reported at the time of the MSU (Stantec, 2006). A surcharge program or lightweight fill program was recommended to be considered as the design process continued. Details are found in ***Appendix E***.

The proposed major system design is to have employment, commercial, park, medium density residential, and medium-high density residential blocks within the North West quadrant provide onsite storage up to the 100-year storm event. The remaining areas are to have overland flow stored within the road network, then directed towards EUC Pond 1. The routing is to follow the overland flow network shown in ***Drawing 2***. Overland flow from the medium-high density blocks and the 4.64 ha park is intended to be directed towards EUC Pond 1 via an open ditch in or near the Hydro Corridor. Where the collector road crosses the open ditch, culvert crossings will be required in order to meet the ponding requirements for collector roads. Assumptions related to Brian Coburn Boulevard, the Transitway, and Hydro Corridor drainage are described in ***Appendix E.*** Specifically, for the future Transitway, a runoff coefficient of 0.8 has been assumed, 10-year capture has been assumed, and storage up to the 100-year design storm has been assumed, with quality control treatment to be provided by an OGS unit if Transitway discharge is to be directed to the North Main Cell (e.g. bypassing the forebay).

A stormwater model has been prepared for the North West quadrant within the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019) – see ***Appendix E***. The modelling indicates that the main road network and the Hydro Corridor are expected to adequately convey major system flow per City of Ottawa and MECP standards.

As shown in the proposed grading plan, road grade elevations for the conceptual road network are anticipated to be between 0-3 m above existing ground, which in certain areas is higher than the maximum permissible grade raise of 2 m per the *Geotechnical – Existing Conditions Report East Urban Community Mixed Use CDP* (Paterson Group, July 7, 2019). Note that the conceptual road network is subject to change. The grading plan has been designed as low as possible to best respect the grade raise restrictions and was determined by providing minimum cover to the infrastructure (assuming full basements for all land uses), facilitating major system flow to the EUC Pond 1, and respecting existing road grades in the surrounding quadrant.

Since the proposed grading plan indicates portions of the North West quadrant to be above proposed grade raise restrictions, a surcharge program or lightweight fill program may be required to the satisfaction of a licensed Geotechnical Engineer in Ontario. As the design process advances for the quadrant, grading plans, grade raise restrictions, surcharge programs and fill specifications will be required from a Geotechnical Engineer. Additional geotechnical investigation may provide some relief to grade raise

restrictions in the area. Opportunities to reduce cover requirements will be further assessed as part of detailed design.

A summary of the stormwater management strategy servicing for the North West quadrant is provided in ***Table 20.***

Table 20: Summary of Stormwater Management Strategy – North West Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006)	Servicing Report for Trails Edge and Orléans Business Park (DSEL, July 2017)	EUC Phase 3 Area CDP MSS (October 2019)
Minor System Stormwater Management Strategy	Quadrant and other lands considered part of the Orléans Business Park to be serviced by an internal trunk storm sewer network consisting of two trunk sewers. Trunk sewer to join before being outlet into the North Forebay of EUC Pond 1 via 2400 mm x 3000 mm trunk sewer.	Quadrant and other lands considered part of the Orléans Business Park to be serviced by an internal trunk storm sewer network consisting of two trunk sewers. Trunk sewer to join before being outlet into the proposed expansion of North Forebay of EUC Pond 1 via 3000 mm x 3000 mm trunk sewer.	Quadrant and future commercial lands to the north to be serviced by an internal trunk storm sewer network consisting of two trunk sewers. Trunk sewers outlet into the proposed expansion of North Forebay of EUC Pond 1 via max 2700 mm diameter trunk sewers.
Total Area to EUC Pond 1 North Forebay	169.3 ha.	171.18 ha.	135.6 ha for the North West quadrant and future commercial lands to the north. 30.45 ha for the 3490 Innes Road Development per Design Brief for Caivan (Orléans Village) Limited – 3490 Innes Road (DSEL, May 2018).
Avg C.	0.75	0.83	0.73
Total Rational Method Minor System Peak Flow to EUC Pond 1 North Forebay	20,967.2 L/s.	20,530 L/s	14,104 L/s for the North West quadrant and external commercial lands to the north. 3,820 L/s for 3490 Innes Road Development per *Design Brief for Caivan (Orléans Village) Limited*

			– 3490 Innes Road (DSEL, May 2018)
Major System Stormwater Management Strategy	Overland flow to be directed towards the EUC Pond 1, partially through Hydro corridor.	Overland flow to be directed towards the EUC Pond 1.	Overland flow to be directed towards the EUC Pond 1, partially through Hydro corridor. Specific lands to provide onsite storage up to the 100-year storm event.

11.2.5 EUC Pond 1

EUC Pond 1 was first recommended as part of the *East Urban Community Sanitary and Storm Drainage Master Plan Update* (Gore & Storrie, 1990) and the *East Urban Community Master Drainage Plan* (Gore & Storrie, 1990). The design for the stormwater facility was later modified by the *East Urban Community Master Drainage Plan Addendum* (Stantec, 2000) and it was finally constructed as per the *East Urban Community Pond No. 1 Design Brief* (Stantec, 2008).

The existing EUC Pond 1 was designed with a drainage area of 326 ha, with an average imperviousness of 57% and to provide a normal level of protection (70% average long-term suspended solids removal).

Modifications have been undertaken on the South Main Cell and South Forebay of the EUC Pond 1, per the *East Urban Community Stormwater Management Pond 1 for Trails Edge Subdivision* (DSEL/JFSA, March 2014). Modifications were made to accommodate an increase in imperviousness within the pond drainage area south of the Hydro Corridor and to update the storage to meet updated City of Ottawa & MECP standards. EUC Pond 1 characteristics from the *East Urban Community Stormwater Management Pond 1 for Trails Edge Subdivision* (DSEL/JFSA, March 2014) are summarized in ***Table 21.***

Table 21: EUC Pond 1 Characteristics per East Urban Community Stormwater Management Pond 1 for Trails Edge Subdivision (DSEL/JFSA, March 2014)

Item	Target
Drainage Area	370.362 ha
Required Permanent Pool Volume	19,259 m^3
Required Quality Control Volume	14,814 m^3
Required Extended Detention Volume	27,645 m^3
Allowable Release Rate	2-year : 1000 L/s 5-year : 2300 L/s 10-year : 3800 L/s 25-year : 5600 L/s 50-year : 6700 L/s 100-year : 8000 L/s

As part the EUC Phase 3 Area CDP, the preferred solution to service the area is to expand the north cell of EUC Pond 1 to accommodate the subject area's stormwater flows within current City of Ottawa and MECP standards (**Section 7.0**). The design details for the proposed expanded EUC Pond 1 are included

within the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019), provided in ***Appendix E***.

The design intent for the North Main Cell and North Forebay expansion is for the key operating water levels of EUC Pond 1 and peak outflow rates of EUC Pond 1 to remain consistent with the original 2008 Stantec EUC Pond 1 design; similar to the design intent for the modifications that were recently undertaken to the South Main Cell and South Forebay of EUC Pond 1. A normal level of protection (70% average long term total suspended solids removal) is to be maintained for the overall drainage area, at minimum, to match existing approvals.

The North Main Cell is proposed to be deepened and expanded, keeping the same Permanent Pool level of 80.10 m and the same 100-year water level of 83.00 m as in the original *Design Brief* (Stantec, 2008). Two new North Forebays are to be provided, with Permanent Pool levels dropping from the planned 81.50 m to be equal to the North Main Cell at 80.10 m. Flows in excess of the 25 mm storm event are proposed to bypass the North Forebays and be directed to the North Main Cell, to avoid resuspension of sediment in the forebays. A summary of required characteristics from the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019) is provided in ***Table 22***. Sediment storage/removal strategies are assumed to be unchanged from the original *Design Brief* (Stantec, 2008). The sediment management area for EUC Pond 1 is currently located within City-owned lands within the Hydro Corridor (see ***Appendix I*** for detailed sediment management area drawings).

Table 22: Required EUC Pond 1 Characteristics per *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019)

Item	Target
Drainage Area	367.308 ha @ 65% Imperviousness
Required Permanent Pool Volume	30,609 m^3
Required Quality Control Volume	14,692 m^3
Required Extended Detention Volume	43,405 m^3

The opportunity to expand the North Main Cell and North Forebay to provide a higher treatment standard has been explored and implemented in the pond footprint shown in ***Figure 3***. Specifically, the proposed pond expansion will provide Enhanced treatment (80% average long-term annual TSS removal) for all areas that are to be treated by the new North Forebays (see ***Appendix I*** for detailed calculations). When combining the performance of the existing South Forebay and South Main Cell with the proposed North Main Cell Expansion and new North Forebays, the average blended rate is 76% average long-term annual TSS removal.

Per the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019), the anticipated 100-year waterlevel of 82.92 m is below the maximum allowable 100-year WL of 83.0 m from the original Stantec Design Brief (2008).

A summary of EUC Pond 1 operating characteristics under from the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019) is provided in ***Table 23***.

Table 23: Summary of SWM Facility 1 Operating Characteristics under Ultimate Conditions per North Cell Modifications in *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019)

Pond Component	Water Level (m)				Volume Used (m^3)	Allowable Outflow (m^3/s)	Provided Outflow (m^3/s)
	North Forebay	North Main Cell	South Forebay	South Main Cell			
Permanent Pool	80.100	80.100	81.500	80.10	43329	N/A	N/A
Quality Control	80.471	80.471	N/A	80.471	14692	N/A	0.137
Extended Detention	81.650	81.650	81.650	81.650	67410	N/A	0.383
2-Year, 24-Hour SCS	81.761	81.758	81.916	81.757	66193	1.000	0.461
5-Year, 24-Hour SCS	82.130	82.126	82.125	82.125	85838	2.300	0.981
10-Year, 24-Hour SCS	82.308	82.304	82.303	82.303	96162	3.800	1.294
25-Year, 24-Hour SCS	82.590	82.584	82.583	82.583	112944	5.600	2.603
50-Year, 24-Hour SCS	82.754	82.751	82.751	82.751	123225	6.700	4.057
100-Year, 24-Hour SCS	82.916	82.910	82.917	82.917	133392	8.000	5.716
July 1st, 1979 Event	83.045	83.042	83.047	83.047	141725	N/A	7.242
August 4, 1988 Event	82.792	82.788	82.794	82.794	125648	N/A	4.425
August 8, 1996 Event	82.608	82.602	82.602	82.602	114050	N/A	2.737

Per the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019), the proposed expanded EUC Pond 1 is in conformance with all requirements presented in the *East Urban Community Stormwater Management Pond 1 for Trails Edge Subdivision* (DSEL/JFSA, March 2014). The pond has been sized taking into account contributions from existing development (e.g. Nature Trail residential area, Orleans Village, etc.) and also a peak flow of 22 L/s discharge from the snow dump facility and associated forcemain.

The footprint of the proposed expanded EUC Pond 1 can be seen in ***Figure 3***. As discussed in ***Section 4.5.3*** of this report, setbacks from the headwater features near the pond were taken into consideration when determining the pond footprint: specifically the requirements outlined in the *Headwater Drainage Feature Assessment 3490 Innes Road Development* (Kilgour & Associates, July 27, 2017), the *Environmental Impact Statement for SWM Pond Expansion in East Urban Community Mixed Use Centre* (Kilgour & Associates, Sept 5, 2018), the updated boundary of the Significant Woodland per the *Technical Memorandum* (Kilgour & Associates, June 2019), and discussions with RVCA staff. Additionally, per the requirements reported in the *Slope Stability Assessment Reaches 7 and 12 Storm Water Management Pond Block* (Golder Associates, June 2019), 11 m and 7 m setbacks were provided from the top of slopes from reaches 7 and 12, respectively. The configuration of the new North Forebays and North Main Cell reflect MECP requirements for an elongated flow path, while not encroaching on the Significant Woodland near the existing headwater features (Kilgour & Associates, June 2019).

11.2.6 Consideration of Alternative Implementation Details for Servicing Designs

Storm sewer routing and sizing has been optimized as part of the MSS-level servicing design, to address City of Ottawa and MECP standards. A single trunk and single forebay option was explored (***Appendix I***), and involved large diameter storm sewers (3000mm dia) within local ROWs. Although this may offer infrastructure savings, splitting the flows into multiple trunks allows for ease of maintenance of construction.

Different capture rates and storage rates were considered for the medium density, medium-high density, and park blocks, given that on-site storage requirements are sometimes considered not to be cost-effective to implement for these land uses. See ***Appendix I***, which allowed for 100-year capture for some areas, and removed 100-year storage requirements for other areas. Through different iterations of stormwater modelling and discussions with the affected landowners, limited capture and 100-year storage have been implemented in the proposed MSS. Please note that assumptions related to capture and storage on park blocks is consistent with Building Better and Smarter Suburbs, Implementation, Quick Wins (2015), as well as recent master servicing studies completed within the City of Ottawa.

The proposed pond footprint was developed to respect the proposed CDP boundary and development plan - which has been developed with agency stakeholders to achieve efficient block arrangement, sizes, etc. – and the development limits described in the *Headwater Drainage Feature Assessment 3490 Innes Road Development* (Kilgour & Associates, July 27, 2017), the *Environmental Impact Statement for SWM Pond Expansion in East Urban Community Mixed Use Centre* (Kilgour & Associates, Sept 5, 2018), the updated boundary of the Significant Woodland (Kilgour & Associates, June 2019), and the *Slope Stability Assessment Reaches 7 and 12 Storm Water Management Pond Block* (Golder Associates, June 2019). The proposed shape of the pond is reflective of the MECP requirement to elongate the flow path, and to minimize impacts on the existing north main cell of EUC Pond 1 during construction of the expansion. The expansion has preserved the Significant Woodland around EUC Pond 1, but requires some tree removal (approximately 1.9 Ha) in support of the pond expansion. This is consistent with the original footprint of EUC Pond 1, where trees were cleared for the purpose of the original stormwater management pond construction. ***Section 13*** explains that mitigation measures are considered adequate to address the tree removal requirements for the pond expansion, and tree permit applications will require City of Ottawa review prior to tree clearing.

Options to extend the storm pond into the Hydro corridor were not considered at this time, because of the location of the existing forcemain that services the snow dump (and associated approval requirements and construction costs for any relocation) and the existing sediment management area.

Allowances for redevelopment of the City snow dump have not been provided in the design of the servicing infrastructure or SWM pond expansion. If the City were to develop this parcel, the peak flow of 22 L/s would need to be respected, or a study would need to be undertaken to define an appropriate release rate given the downstream infrastructure, pond, and watercourses. The Rational Method design sheets show that capacity is available within the pipe adjacent to the snow dump, however downstream storm infrastructure & pond operation would need to be further analyzed to ensure adequacy of service. Quality treatment could be provided on-site, or via the proposed EUC Pond 1 expansion, but would require additional consultation with City and RVCA staff. Rational Method design sheets showing the snow dump as employment lands are provided in ***Appendix I,*** alongside the other alternative considerations described above.

11.3 North East Quadrant Preferred Stormwater Management Plan

11.3.1 North East Existing Stormwater Drainage

The existing development to the north of the quadrant is currently being serviced by a trunk network of 900 mm – 1350 mm diameter storm sewers that run to the 1800 mm – 1950 mm diameter Wildflower Drive storm sewer before ultimately discharging into Bilberry Creek. The existing storm sewer network surrounding the North East quadrant is shown in ***Drawing 7***.

11.3.2 North East Minor System Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service the North East quadrant of the EUC Phase 3 Area. The MSU (Stantec, July 2006) considered the North East quadrant to be serviced by the Wildflower Drive storm sewer through the lands to the north of the quadrant. The flow was then to travel north along the Wildflower Drive storm sewer, outlet to Bilberry Creek, then be treated by the existing SWM pond at Avenue Des Epinettes. The storm collector sewers considered in the MSU (Stantec, July 2006) can be seen in ***Appendix E***. The release rate for the minor system was reported to be controlled to 50 L/s/ha for all developments within the North East quadrant, and 100 L/s/ha for all roadways. While the SWM pond at Avenue Des Epinettes provides quality control to normal protection criteria (70% TSS removal), onsite quality control measures were recommended to be implemented during site plan control processes for developments within the North East quadrant.

Per the Storm Collector Sewers and Drainage Areas figure included in ***Appendix E***, the North East quadrant was considered as 28.4 ha development area and 2.46 ha roads in the MSU (Stantec, July 2006). Using the 50 L/s/ha and 100 L/s/ha capture rates, the anticipated Rational Method peak stormwater flow for the North East quadrant is equivalent to 1,666 L/s. When including the downstream area (9.4 ha development area and 1.0 ha roads) draining to the same node in the Wildflower Drive storm sewer (node F30), the updated rational method peak flow to the Wildflower Drive sewer from the North East quadrant and additional lands is 2,236 L/s.

More recently, the North East quadrant's stormwater management has been considered in ongoing development applications. Per the *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018), the peak discharge from the site is reported as 50 L/s/ha for development lands and 100 L/s/ha for roadways, consistent with the MSU (Stantec, July 2006). No deviations from the MSU (Stantec, July 2006) servicing strategy are proposed within the ongoing development applications, and a rational method peak stormwater flow of 1552.9 L/s was reported for a 27.67 ha portion of the North East quadrant. While no changes are proposed to the servicing strategy, a change in road network contributes to the difference in peak flows. It was assumed within the development applications that enhanced protection (80% TSS removal) would be required for all development parcels within the North East quadrant.

A proposed stormwater management servicing strategy can be seen in ***Drawing 4***. Consistent with the ongoing development applications and the MSU (Stantec, July 2006), the storm sewers could follow the Vanguard Drive extension and the internal road network to drain into the existing 1350 mm diameter storm

sewer north of the quadrant, before being directed to the Wildflower Drive storm sewer. Respecting the development applications within the North East quadrant, the proposed stormwater management strategy would have stormwater peak flow controlled to the allowable rates 100 L/s/ha for Vanguard Drive. As the other roads in the North East quadrant are based on the demonstration plan and are subject to change, an allowable release rate of 51.25 L/s/ha would be applied to all the other lands in the quadrant (to account for the addition of local roads in the future at 100 L/s/ha). The corresponding design sheet is provided in ***Appendix E***.

Using the 51.25 L/s/ha rate, the proposed peak rational method flow from the quadrant would be equivalent to the MSU (Stantec, July 2006)'s rational method flow of 1666 L/s. The rate was determined by removing the flow attributed to the 1.73 ha stretch of Vanguard Drive from the 1,666 L/s flow allowance and evenly distributing the remaining allowance between the 28.4 ha of development lands within the North East quadrant. As the proposed peak flow from the North East quadrant is equivalent to the flow anticipated in the MSU (Stantec, July 2006), it would be anticipated that there would be adequate capacity within the Wildflower Drive storm sewer for the North East quadrant's stormwater flows. Per the *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018) the existing 1350 mm diameter sewer north of the quadrant is installed at a 0.25% slope which results in a capacity of 2,669 L/s. Since the peak flow to the Wildflower Drive sewer from the North East quadrant and the downstream area is anticipated to be 2,236 L/s, the existing 1350 mm diameter storm sewer would have adequate capacity to service the North East quadrant.

Any flows above the allowed release rates would need to be stored onsite per the major system detailed in ***Section 11.3.3*** or addressed through other site-specific storage. Note that at this stage of design, only the trunk storm sewers within the quadrant are shown. The quadrant is expected to be serviced by a network of local sewers draining to the trunk sewers shown. To demonstrate servicing feasibility, the trunk sewer has been carried back at minimum possible slopes while accounting for drops at manholes, existing infrastructure sizing and possible conflicts with the proposed sanitary sewer. As design of the parcels comprising the North East quadrant advance, the storm sewer network details are subject to change, to achieve construction cost efficiencies, etc., provided that the conditions related to minor changes in ***Section 14*** are met.

As noted in ***Section 4.4***, there are identified erosion issues in Bilberry Creek, with mitigation measures being considered at a watershed scale. During detailed site-specific review of future detailed development applications, the currently established quantity control targets (51.25 L/s/ha for development lands and 100 L/s/ha for Vanguard Drive so as to be equivalent to the MSU (Stantec, July 2006)) may be reviewed by the City and RVCA relative to the estimated erosion thresholds and erosion characteristics of Bilberry Creek outlined in the *Bilberry Creek Geomorphic Systems Master Implementation Plan* (GHD, May 2014) and the findings of the *Eastern Subwatersheds Stormwater Management Retrofit Study (Morrison Hershfield, December 21, 2018)*. The review may assess whether the proposed control level is sufficient for the particular development application or whether there would be any added benefit to further control, while considering that the North East quadrant is only a small portion of tributary area to Bilberry Creek relative to the watershed as a whole. The City has indicated that Vanguard Drive is expected to act as a drainage split, so that the area to the south may be directed to McKinnon's Creek, instead of Bilberry Creek as previously proposed in background studies. This may involve incorporating infiltration measures, surface

or underground storage measures, etc., within the lands in the North East quadrant. Regardless of the measures, it is understood that the City is planning to address outlet eligibility and stormwater management requirements through Planning Act approvals for development applications within this area.

11.3.3 North East Major System & Grading Design

Per the MSU (Stantec, July 2006), all developments within the North East quadrant were required to provide onsite storage up to the 100-year storm event, based on the minor system release rate of 50 L/s/ha for development lands. Road sags were proposed to provide storage for roadways, up to the 100-year storm event, based on the minor system release rate of 100 L/s/ha for roadways. The proposed grading plan is to direct any stormwater runoff in excess of the 100-year storm event to Innes Road. The proposed grading plan was based on existing road grades on Innes Road and Vanguard Drive and to provide minimum cover for sewers. No grade raise restriction was reported in the MSU (Stantec, July 2006).

The ongoing development applications within the North East quadrant propose on-site storage and road sag storage to provide adequate storage up to the 100-year storm event. No overland flow is proposed up to the 100-year storm event. For storm events exceeding the 100-year storm event, proposed grading is to direct any excess flow to Vanguard Drive per the *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018). The proposed grading plan is based on existing road grades on Mer Bleue Road, Vanguard Drive, and the existing development to the north. Per the *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018), the proposed grading plan provides minimum cover for sewer and respects the site-specific grade raise restriction of 2 m areas within 6 m of a building and 2.5 m elsewhere, as reported in the geotechnical investigation included in the appendices of the *Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision* (Stantec, April 12, 2018). Details are provided in ***Appendix E***. Note that these reported grade raise restrictions are slightly higher than grade raise restrictions of 0.5-1 m and 2 m, as outlined in the *Geotechnical – Existing Conditions Report East Urban Community Mixed Use CDP* (Paterson Group, June 28, 2018) for the North East quadrant.

The proposed grading plan can be seen in ***Drawing 2***. The grading respects the ongoing development applications and the major system stormwater management strategy. Storage up to the 100-year storm event is required for all flows exceeding the capture rates of 100 L/s/ha for Vanguard Drive and 51.25 L/s/ha for all development area. Road sag storage and onsite storage are required to meet this criteria. Note that should sufficient road storage be unavailable, additional storage in surrounding blocks will be required to ensure 100-year storage is provided. Should onsite storage provided prove to be insufficient on the surface of the development blocks, storage can be accounted for in roof attenuation or subsurface storage may be required. A detailed stormwater analysis may be required for the North East quadrant as the design process continues to prove storage requirements are met.

As shown in the proposed grading plan, road grade elevations for the conceptual road network are anticipated to be approximately 1 m above existing in some areas. The maximum permissible grade raise for portions of the North East quadrant is 0.5-1.5 m per the *Geotechnical – Existing Conditions Report East Urban Community Mixed Use CDP* (Paterson Group, June 28, 2018). The remaining portions have a grade raise restriction of 2 m. Note that the conceptual road network is subject to change. The grading plan has

been designed as low as possible to best respect the grade raise restrictions and was determined by providing minimum cover to the infrastructure (assuming basements for all land uses with gravity foundation drainage) and respect existing/proposed road grades surrounding the quadrant. Note that the outcome of the Vanguard Drive Environmental Assessment (City of Ottawa, ongoing) and discussions about the potential diversion of part of the North East quadrant to McKinnon's Creek, may affect grading strategies for this quadrant.

As the proposed grading plan indicates portions of the North East quadrant to be above proposed grade raise restrictions, a surcharge program or lightweight fill program may be required to the satisfaction of a licensed Geotechnical Engineer in Ontario. As the design process advances for the quadrant, grading plans, grade raises, surcharge programs and fill specifications will be required from a Geotechnical Engineer.

A summary of the stormwater management strategy servicing for the North East quadrant is provided in ***Table 24.***

Table 24: Summary of Stormwater Management Strategy – North East Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006)	Site Servicing and Stormwater Management Report – Orléans II Draft Plan of Subdivision (Stantec, April 12, 2018) and Servicing Options Report for Blacksheep Developments 2159 Mer Bleue Road (DSEL, December 2017)	EUC Phase 3 Area CDP MSS (October 2019)
Minor System Stormwater Management Strategy	Quadrant to be serviced by internal trunk storm sewer network running through northern adjacent lands to the 1800 mm diameter Wildflower Drive sewer before ultimately draining into Bilberry Creek.	Quadrant to be serviced by internal trunk storm sewer network running through northern existing storm network to the 1800 mm diameter Wildflower Drive sewer before ultimately draining into Bilberry Creek.	Quadrant to be serviced by internal trunk storm sewer network running through northern existing storm network to the 1800 mm diameter Wildflower Drive sewer before ultimately draining into Bilberry Creek, unless future watershed analysis (by others) proposed redirection of flows south of Vanguard Drive towards McKinnon's Creek.
Total Area to Existing 1350mm diameter sewer	30.86 Ha	27.67 Ha (portion of north east quadrant)	30.86 Ha*

north of quadrant			
Avg. C	0.7	N/A	0.82*
Capture Rate – Development Lands	50 L/s/ha	50 L/s/ha	51.25 L/s/ha to account for future roads in development areas as road network is subject to change.*
Capture Rate – Roads	100 L/s/ha	100 L/s/ha	100 L/s/ha. Only Vanguard Drive (collector road) considered as road network is subject to change.*
Peak rational method total flow to Ex. 1350mm diameter stub	1666 L/s	1552.9 L/s	1666 L/s*
Major System Stormwater Management Strategy	On site storage and road sags proposed to meet the required release rates. Storage within quadrant up to 100 year storm event.	On site storage and road sags proposed to meet the required release rates. Storage within quadrant up to 100 year storm event.	On site storage and road sags proposed to meet the required release rates. Storage within quadrant up to 100 year storm event.*
**Reported values are based on background studies that contemplate the North East quadrant draining to Bilberry Creek. These values are subject to change based on a watershed analysis to be completed separate from this MSS, and is planned to be implemented through City of Ottawa review of development applications under the Planning Act.*			

11.3.4 Consideration of Alternative Implementation Details for Servicing Designs

Stormwater sewer sizing, minor and major flow routing, and preliminary grading were reviewed as part of MSS-level design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area and the predicted performance, no other logical or efficient alternative designs were advanced for additional analysis and evaluation, except for consideration of future diversion from the Bilberry Creek watershed to the McKinnon's Creek watershed. This is to be completed at the watershed level, to inform future development applications within the area, and is planned to be implemented via *Planning Act* approvals.

11.4 South West Quadrant Preferred Stormwater Management Plan

11.4.1 South West Existing Stormwater Drainage

The quadrant was at one time tributary to the Mud Creek and McKinnon's Creek watersheds, which drain into Green's Creek (Ottawa River) and Bear Brook (South Nation River), respectively. Current earthworks programs associated with development have redirected drainage from existing conditions.

Existing developments to the southwest of the quadrant have brought a storm sewer network to the southern boundary of the South West quadrant. A 1050 mm diameter storm sewer stub borders the portion of the South West quadrant west of Fern Casey Street, and a 2700 mm diameter stub borders the portion of the quadrant east of Fern Casey Street. A 900 mm-1050 mm diameter storm sewer within Brian Coburn Boulevard is located within the South West quadrant. To the east, there is a 525 mm-900 mm diameter storm sewer on Mer Bleue Road. The existing storm sewer network is shown in ***Drawing 7***.

11.4.2 South West Minor System Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service the South West quadrant of the EUC Phase 3 Area. The intended storm outlet for the quadrant is the existing South Forebay of EUC Pond 1.

The MSU (Stantec, July 2006) considered the South West quadrant to be serviced by trunk storm sewers ranging in diameter from 1250 mm to 2400 mm. The minor system generally drains east to west, through adjacent lands towards the EUC Pond 1 South Forebay. 5-year capture was used for all development lands and local roads, while 10-year capture was applied for arterial roads. The minor system did not consider flows from Brian Coburn Boulevard (then known as the Blackburn Hamlet By-Pass) as it was assumed that the drainage would be addressed through a separate sewer. The portion of the South West quadrant north of Brian Coburn was also assumed to drain separately from the rest of the quadrant. Details of the MSU (Stantec, July 2006) minor system can be found in ***Appendix E***.

More recently, the South West quadrant was considered as part of the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017). Consistent with the MSU (Stantec, July 2006), the quadrant was to be serviced by a trunk sewer network draining towards the EUC Pond 1 South Forebay. A stormwater conveyance channel was detailed to direct outflows from the trunk storm sewers to the EUC Pond 1 South Forebay. The storm drainage plan can be seen in ***Drawing 4***. 5-year capture was used for all development lands and local roads, while 10-year capture was applied for arterial roads. Deviating from the MSU (Stantec, July 2006), the portion of the South West quadrant north of Brian Coburn Boulevard and the segment of Brian Coburn Boulevard within the quadrant were assumed to drain through the quadrant's storm sewer network. The majority of the South West quadrant was considered as Mixed-Use and was assigned a runoff coefficient of 0.8. There were also Medium Density and Commercial land uses which were assigned runoff coefficients of 0.7 and 0.65, respectively.

Since the completion of the MSU (Stantec, July 2006), the stormwater management of the South West quadrant has been considered during the construction of downstream infrastructure. The *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015) considers the stormwater drainage for the portion of the South West quadrant that is east of Fern Casey Street. Per the storm design information included in ***Appendix E***, a 2700 mm diameter storm sewer stub exists south of the quadrant. Per the *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015), this stretch of sewer anticipated a Rational Method peak flow of 5,424.84 L/s from undeveloped land to the east, which includes the portion of the South West quadrant that is east of Fern Casey Street. 5-year capture was assumed and an available Rational Method capacity of 5,040.86 L/s was reported available downstream in the constraining segment (MH55 - MH55B).

The *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015) also considered the stormwater drainage for the portion of Fern Casey Street (formerly Belcourt Boulevard) within the South West quadrant. A portion of the street is to drain to Brian Coburn while a portion is being serviced by the storm sewers constructed as part of Trailsedge Phase II.

The stormwater servicing of the South West quadrant has also been considered as part of the approved *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017). As shown in ***Appendix E***, an additional 3.18 ha residential area drains to the existing 2700 mm diameter stub along with the stormwater flows from the portion of the South West quadrant east of Fern Casey Street. Per the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017), a rational method peak flow of 4,824.3 L/s was anticipated from the portion of the South West quadrant that is east of Fern Casey Street. 2-year capture was assumed for the portion of the South West quadrant that is east of Fern Casey Street, deviating from past studies, but consistent with current City of Ottawa and MECP standards. Brian Coburn Boulevard was expected to drain separately consistent with the MSU (Stantec, July 2006) and design information for Brian Coburn Boulevard.

The Trailsedge East lands are currently undergoing detailed design and construction. Per the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018), 5-year capture was assumed for the portion of the South West quadrant east of Fern Casey Street. Note that the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018) proposes to accommodate the stormwater flows from the portion of the South West quadrant east of Fern Casey Street through 2 inlet locations (MH1004 & MH1002). The anticipated Rational Method peak flow attributed to the portion of the South West quadrant east of Fern Casey Street to MH1004 and MH1002 are 4686.2 L/s and 741.52 L/s respectively. All stormwater flows from the South West quadrant east of Fern Casey Street are still proposed to ultimately be directed towards the existing 2700mm diameter stub. Brian Coburn Boulevard is reported to drain separately, which is consistent with the MSU (Stantec, July 2006) and with as-built information for Brian Coburn Boulevard. Details are provided in ***Appendix E***. The total Rational Method peak flow anticipated to the existing 2700 mm diameter storm sewer stub is reported to be 6,154.9 L/s, which is above the 5,424.84 L/s allowance detailed in the *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015). The anticipated increase in flows of 730.06 L/s is below the 5,040.86 L/s available Rational Method capacity downstream in the constraining segment (MH55 – MH55B).

The *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015) includes the stormwater drainage for the portion of the South West quadrant west of Fern Casey Street. 5-year capture was assumed and a rational method peak flow of 845.8 L/s was determined to drain into existing Control MH2. See ***Appendix E*** for details.

Respecting the MSU (Stantec, July 2006), existing stormwater infrastructure and ongoing development applications within the South West quadrant, the proposed stormwater servicing strategy is to have all flows from the quadrant drain to the EUC Pond 1 South Forebay via the existing stormwater conveyance channel and an extension of the existing trunk storm sewer network. The proposed storm sewer network is shown in ***Drawing 4***. A trunk 2100 mm trunk storm sewer is shown servicing the majority of the quadrant by routing minor system stormwater flows to the proposed Trailsedge East storm sewer south of the quadrant. The remaining portions of the South West quadrant drain directly into existing infrastructure. A storm sewer

crosses Brian Coburn Boulevard at an existing gap in underground infrastructure – coordination will be required for work in the ROW, including utility coordination.

Note that at this stage of analysis, only the trunk storm sewer within the quadrant is shown. To demonstrate serviceability, the trunk sewer is carried back at minimum possible slopes accounting for drops at manholes, existing infrastructure sizing and possible conflicts with the sanitary sewer. As design of the South West quadrant advances, the storm sewer network details are subject to change for construction efficiencies, etc., provided that the conditions in Section 14 related to minor changes are met. Springline connections and/or reduced drops across maintenance holes may be proposed as part of detailed design, to assist in minimizing grade raise requirements, provided that the conditions in ***Section 14*** related to minor changes are met.

2-year capture was assumed for all local roads and development lands in the South West quadrant. 5-year capture was used for collector roads in order to adhere to City Standards regarding allowable depth of flow on streets.

The rational method, with design criteria described in ***Section 11.1***, was employed to size the storm sewer to accommodate all minor flows. Per the design sheet included in ***Appendix E***, the anticipated rational method peak flow from the portion of the South West quadrant east of Fern Casey Street is 4,964 L/s. Please note that consistent with the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017), the stormwater flows from the North West quadrant east of Fern Casey Street are directed towards one outlet in this MSS. Outlets and routing alternatives may be refined as the design and construction processes advance.

The proposed 4,964 L/s rational method peak flow to MH 302 is roughly 106% of the 4,686.2 L/s flow anticipated at this location within the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018). A flow of 741.5 L/s was also anticipated from the portion of the South West quadrant east of Fern Casey Street, to be collected further downstream per the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018). Per the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019)(see ***Appendix E)***, the peak modeled flow to the existing stub is 5,800 L/s under the 100-year plus 20% storm event. The proposed design of the South West quadrant east of Fern Casey does not have a negative impact of the downstream stormwater management infrastructure. Therefore, it is concluded that the downstream infrastructure has adequate capacity to service the minor system stormwater flows from the portion of the South West quadrant, east of Fern Casey Street.

The portions of Brian Coburn Drive and Fern Casey Street within the South West quadrant are proposed to continue draining as they are at the time of this MSS.

The anticipated rational method peak flow from the portion of the South West quadrant west of Fern Casey Street is 853 L/s, roughly 101% of the 845.8 L/s flow anticipated in the in the *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015). Seeing as the land is to provide 5-year capture consistent with the *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015), any discrepancy in anticipated rational method peak flow can be attributed to rounding. Per the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design*

(JFSA, June 2019), see ***Appendix E***, the proposed design of the South West quadrant west of Fern Casey is consistent with the design of the downstream stormwater management infrastructure. Therefore, it is concluded that the downstream infrastructure has adequate capacity to service the minor system stormwater flows from the portion of the South West quadrant, west of Fern Casey Street.

11.4.3 South West Hydraulic Grade Line Analysis

Given the preferred minor system design and land uses differ from background studies, a Hydraulic Grade Line analysis was completed for the South West quadrant, using downstream modelling information provided by Stantec from the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018). The suitability of the proposed trunk sewer network was analyzed in the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019), provided in ***Appendix E***. The simulated 100-year HGL results through the proposed trunk storm sewer network have been analyzed for suitability with the proposed road grades and anticipated underside of footing elevations, estimated to be 2.1 m below ground level.

The analysis was simulated with the 100-year 3-hour Chicago storm, 100-year 24-hour SCS Type II storm and July 1979, August 1988 and August 1996 historical events. The results indicated that the quadrant is serviceable per the preferred design as a freeboard of 0.3 m between the hydraulic gradeline and the estimated underside of footing is provided for the 100-year storms and a freeboard of 0 m has been provided for the historical events and the 100-year storm + 20% climate change stress test . As noted earlier, the storm sewer design is expected to change at detailed design (e.g. to include local sewers, to minimize earthworks costs, etc.), and an updated analysis will be required in conformance with all City of Ottawa and MECP guidelines.

11.4.4 South West Major System & Grading Design

The MSU (Stantec, July 2006) did not include a detailed design of the major system for the South West quadrant. Based on the MSU (Stantec, July 2006) Macro Grading Plan, included in ***Appendix E***, the major system flow is generally directed towards the EUC Pond 1 South Forebay. Grade raise restrictions for the South West quadrant are reported as 0-0.6 m and are respected in the grading plan.

Per the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017), the major flow servicing strategy was updated based on the proposed road network. Consistent with the MSU (Stantec, July 2006), the major flow was to be routed westward towards the EUC Pond 1 South Forebay. See ***Appendix E*** for details. The majority of the South West quadrant was reported to provide onsite storage up to the 100-year storm event as they were contemplated for Mixed-Use, High Density Residential and Commercial land uses. The *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017) grading plan reports grade raises up to 3 m within the South West quadrant. This exceeds the grade raise restriction for the quadrant of 0.5 m to 1.5 m per the *Geotechnical – Existing Conditions Report East Urban Community Mixed Use CDP* (Paterson Group, June 28, 2018). As such, a surcharge program or lightweight fill was recommended to be considered as the design process continued.

Per the approved *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017) and the *Trails Edge East Phase 1 Servicing Design Brief* (Stantec, August 2018), onsite storage up to the 100-year storm event was to be provided for the portion of the South West quadrant, east of Fern Casey Street. The *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015) similarly states that onsite storage up to the 100-year storm event was to be provided for the portion of the South West quadrant, west of Fern Casey Street.

The proposed major system design is for commercial and mixed-use blocks within the South West quadrant to provide onsite storage up to the 100-year storm event, which is consistent with background servicing reports for the quadrant. The remaining areas are to have overland flow stored within the road network, then directed towards the EUC Pond 1 via the neighbouring lands to the south. The routing is to follow the proposed road network, as shown in ***Drawing 2***. Note that the medium-high density block west of Fern Casey Street is to have major system flows directed towards Axis Way, while the other medium-high density block is to have major system flows directed towards Fern Casey Street.

Given that the updated preferred stormwater concept has not been detailed in background documents, a stormwater model has been prepared for the South West quadrant within the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019) – see ***Appendix E***. The modelling indicates that the main road network is expected to adequately convey major system flow per City of Ottawa and MECP standards.

As shown in the proposed grading plan, road grade elevations for the conceptual road network are anticipated to be greater than 1.5 m in some areas. The maximum permissible grade raise for the South West quadrant is 0.5 m - 1.5 m per the *Geotechnical – Existing Conditions Report East Urban Community Mixed Use CDP* (Paterson Group, June 28, 2018). Note that the conceptual road network is subject to change. The grading plan has been designed as low as possible to best respect the grade raise restrictions and was determined by providing minimum cover to the infrastructure (assuming basements for all land uses with gravity foundation drainage), facilitating major system flow to the EUC Pond 1, and respecting existing/proposed road grades surrounding the quadrant.

Since the proposed grading plan indicates portions of the South West quadrant to be above proposed grade raise restrictions, a surcharge program or lightweight fill program may be required to the satisfaction of a licensed Geotechnical Engineer in Ontario. As the design process advances for the quadrant, grading plans, grade raises, surcharge programs and fill specifications will be required from a Geotechnical Engineer.

A summary of the stormwater management strategy for the South West quadrant is provided in ***Table 25.***

Table 25: Summary of Stormwater Management Strategy – South West Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006)	Design Brief for the Trails Edge West Richcraft Group of Companies (DSEL, January 26, 2015) and the Trails Edge East Phase 1 Servicing and Stormwater Management Report (Stantec, August, 2018)	EUC Phase 3 Area CDP MSS (October 2019)
Minor System Stormwater Management Strategy	Quadrant to be serviced by trunk storm sewers running through southern adjacent lands to the South Forebay of the EUC Pond 1.	Quadrant to be serviced by trunk storm sewers running through southern adjacent lands and as stormwater conveyance channel to the South Forebay of the EUC Pond 1.	Quadrant to be serviced by trunk storm sewers running through southern adjacent lands and as stormwater conveyance channel to the South Forebay of the EUC Pond 1.
Total Area to Existing Control MH 2	N/A	3.65 ha.	3.68 ha.
Avg. C	N/A	0.8	0.8
Total Rational Method Peak Flow to Existing Control MH 2	N/A	845.8 L/s.	853 L/s.
100-year, 3-Hour Chicago Storm + 20% modelled Peak Flow to proposed Existing Control MH 2	N/A	N/A	1,189 L/s.
Total Area to Proposed MH STM 1004	N/A	27.89 ha to MH 1004 & 3.20 ha to MH 1002 downstream	29.28 ha.
Avg. C	N/A	0.8	0.78
Total Rational Method Peak Flow to Proposed STM MH 1004	N/A	4,686.2 L/s to MH 1004 & 757.8 L/s to MH 1002 downstream	4,964 L/s
100-year, 3-Hour Chicago Storm + 20% modelled Peak Flow to existing	N/A	N/A	5,800 L/s.

stub on Fern Casey Street			
Major System Stormwater Management Strategy	Overland flow to be directed towards the EUC Pond 1.	Overland flow to be directed towards the EUC Pond 1. Onsite storage up to the 100-year storm event was to be provided.	Overland flow to be directed towards the EUC Pond 1. Onsite storage up to the 100-year storm event is to be provided for mixed use and commercial land uses.

11.4.5 Consideration of Alternative Implementation Details for Servicing Designs

Stormwater sewer sizing, minor and major flow routing, and preliminary grading were reviewed as part of MSS-level servicing design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area and the predicted performance, no other logical or efficient alternative designs were advanced for additional analysis and evaluation.

The use of sump pumps for foundation drainage is recommended to be advanced for consideration in detailed design as an alternative design for residential areas in the South West quadrant. Per City of Ottawa standards, sump pumps are only to be considered as drainage solutions under certain conditions per ISTB-2018-04 and subsequent Technical Bulletins. The area must be on full services, be underlain by clay soils subject to grade raise restrictions and have finished grades required to allow gravity drainage exceed the grade raise restriction. Finally, the HGL of the area cannot be able to be reasonably lowered any further due to outlet restrictions. Given the South West quadrant meets all of these requirements, sump pumps may be considered as an alternative for the South West as the design process advances. See Paterson Group (July 7, 2019) for additional details.

11.5 South East Quadrant Preferred Stormwater Management Plan

11.5.1 South East Existing Stormwater Drainage

Existing residential developments to the east of the South East quadrant have brought a 1350 mm diameter storm sewer stub to the eastern property boundary. This stub connects to the 1650 mm diameter storm sewer within Gerry Lalonde Drive, ultimately running to the existing Avalon West (Neighborhood 5) Stormwater Management Facility via an existing storm sewer network shown in ***Drawing 7***.

A portion of the Hydro Corridor to the north of the quadrant is serviced by the existing 450 mm diameter storm sewer on Trigoria Crescent. The sewer then follows the existing storm sewer network to the existing Avalon West (Neighborhood 5) Stormwater Management Facility and ultimately McKinnon's Creek.

The portion of the South East quadrant designated as Medium Density has already been constructed and is being serviced by the 1350 mm diameter storm sewer stub mentioned above.

11.5.2 South East Minor System Design

The *Mer Bleue CDP ISS* (IBI Group, April 2006) reviewed the required infrastructure to service this quadrant of the EUC Phase 3 Area. As such, the South East quadrant is tributary to the existing Avalon West (Neighborhood 5) Stormwater Management Facility and ultimately McKinnon's Creek.

The *Mer Bleue CDP ISS* (IBI, April 2006) considered the South East quadrant to be serviced by two outlets into a 1650 mm diameter trunk storm sewer, east of the quadrant on Gerry Lalonde Drive. The stormwater flow was then to travel south via a network of trunk storm sewers into the Neighborhood 5 Cumberland East Urban Community stormwater management pond before ultimately being released into McKinnon's Creek. The quadrant was to have a controlled inlet capacity of 85 L/s/ha.

More recently, the South East quadrant's stormwater management has been considered within the *Avalon West (Neighbourhood 5), Western Trunk Storm Sewer and Interim Stormwater Management Report, Revision 2* (IBI Group, February 2012) and the *Avalon West (Neighbourhood 5), Stormwater Management Facility Design, Revision 2* (IBI Group, October 2012) where deviations from the 85 L/s/ha inlet capacity, were reported. An allowable release rate of 778.6 L/s was reported for the institutional lands. A release rate of 236.8 L/s for the medium density block was determined within the *Taggart Group of Companies Infrastructure Servicing Brief* (Exp., November 20, 2013) based on release rates within the *Avalon West (Neighbourhood 5), Stormwater Management Facility Design, Revision 2* (IBI Group, October 2012). See ***Appendix E*** for release rate calculations.

The *Avalon West (Neighbourhood 5), Stormwater Management Facility Design, Revision 2* (IBI Group, October 2012) deviates from the *Mer Bleue CDP ISS* (IBI, April 2006) by routing the entirety of the flow from the South East quadrant to the 1650 mm diameter trunk sewer on Gerry Lalonde Drive via one outlet. The northern outlet proposed to service the northern portion of the quadrant in the *Mer Bleue CDP ISS* (IBI, April 2006) is no longer considered. Seeing as the flow in the Gerry Lalonde trunk sewer is routed southwards, no constraints arise by moving flow downstream to a single southern outlet into the Gerry Lalonde sewer.

Ongoing development applications in the South East quadrant consider an on-site stormwater system to convey stormwater to the 1350 mm diameter storm sewer stub. This routing is consistent with the *Avalon West (Neighbourhood 5), Stormwater Management Facility Design, Revision 2* (IBI Group, October 2012). The stormwater flow will continue towards the Neighborhood 5 Cumberland East Urban Community stormwater management pond (Avalon Pond 5), consistent with the *Mer Bleue CDP ISS* (IBI, April 2006). For the institutional lands, inlet control devices and flow control roof drains are proposed within the *Orléans Family Health Hub Stormwater Management & Servicing Report* (Exp., April 5, 2018) to limit the stormwater runoff to the allowable release rate of 778.6 L/s. The Medium Density block was constructed with a flow control device, as well as separate foundation drainage sewers to limit the stormwater flow to the determined allowable release rate of 236.8 L/s.

Respecting the development applications within the South East quadrant, the proposed stormwater management strategy is to have the stormwater peak flow from the Institutional land controlled to the allowable release rates of 778.6 L/s and to continue to have the Medium Density block controlled to a peak

flow of 236.8 L/s. The portion of the Hydro Corridor not draining through the South East quadrant will continue draining to the existing storm sewer on Trigoria Crescent. The controlled flows are to be released in to the 1350 mm diameter stub, which is connected to the 1650 mm diameter trunk storm sewer on Gerry Lalonde Drive. Following the existing storm sewer shown in ***Drawing 7***, the stormwater is to be routed towards the Cumberland East Urban Community stormwater management pond, which is consistent with the Mer Bleue CDP ISS (IBI, April 2006). As the flows are to be controlled to the release rates reported within the *Avalon West (Neighbourhood 5), Western Trunk Storm Sewer and Interim Stormwater Management Report, Revision 2* (IBI Group, February 2012) and the *Avalon West (Neighbourhood 5), Stormwater Management Facility Design, Revision 2* (IBI Group, October 2012), the existing infrastructure is anticipated to adequately service the proposed stormwater management minor system design.

The design of the South East quadrant minor system can be seen in ***Drawing 4***. Corresponding design sheets can be found in ***Appendix E***. Note that any flows above the allowed release rates will need to be stored or routed via the major system detailed in ***Section 11.5.3***. At this stage of analysis, only the trunk storm sewer within the quadrant is shown. The quadrant is expected to be serviced by a network of local sewers draining to the trunk sewer shown. To demonstrate servicing feasibility, the trunk sewer is carried back at minimum possible slopes accounting for drops at manholes, existing infrastructure sizing and possible conflicts with the proposed sanitary sewer. As design of the parcels comprising the South East quadrant advance, the storm sewer network details are subject to change in order to achieve construction efficiencies, reflect detailed design constraints and new information inputs, etc., provided that the conditions related to minor changes in ***Section 14*** are met.

11.5.3 South East Major System & Grading Design

Within the *Mer Bleue CDP ISS* (IBI, April 2006), it was anticipated that all stormwater flows up to the 100-year storm event would be stored within the quadrant. Surface storage on roads, storage in parks, and storage in oversized storm pipes were all recommended to ensure the storage requirements were satisfied. An emergency overland flow route was provided to accommodate flows in excess of the 100-year storm, with the flow routed to Gerry Lalonde drive then southward over Brian Coburn Boulevard, an arterial road, towards McKinnon's Creek.

The Institutional lands are proposed to allow for storage up to the 100-year storm event through road and roof storage, which is consistent with ongoing development applications.

The existing Medium Density block continues to provide storage up to the 100-year storm event, primarily through oversized storm sewers and manholes, and with some additional surface storage.

Consistent with the *Mer Bleue CDP ISS* (IBI, April 2006), excess runoff above the 100-year storm event is proposed to flow overland offsite to Gerry Lalonde Drive and crossing over Brian Coburn Boulevard.

Therefore, the proposed drainage systems are expected to safely capture, store and convey all storms up to and including the 100-year event in accordance with the requirements of the *Mer Bleue CDP ISS* (IBI, April 2006) and City Standards.

As the South East quadrant has no local roadways shown in the demonstration plan, no grading was considered within this MSS. Rather, grading design within the blocks should be completed as designs for the parcels comprising the South East quadrant advance. Grading must respect all City Standards, provide adequate cover for storm and sanitary sewers, and respect existing grades surrounding the quadrant.

A summary of the stormwater management strategy for the South East quadrant is provided in ***Table 26.***

Table 26: Summary of Stormwater Management Strategy – South East Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Mer Bleue CDP ISS (IBI, April 2006)	Orléans Family Health Hub Stormwater Management & Servicing Report (Exp, April 5, 2018) and Taggart Group of Companies Infrastructure Servicing Brief (Exp, November 20, 2013)	EUC Phase 3 Area CDP MSS (October 2019)
Minor System Stormwater Management Strategy	Quadrant to be serviced by the Neighborhood 5 Cumberland East Urban Community stormwater management pond and the sewer network to the east via two outlets to the 1650 mm diameter trunk on Gerry Lalonde Drive.	Quadrant to be serviced by the Neighborhood 5 Cumberland East Urban Community stormwater management pond and the existing sewer network to the east via the 1650 mm diameter stub on quadrants eastern boundary.	Quadrant to be serviced by the Neighborhood 5 Cumberland East Urban Community stormwater management pond and the existing sewer network to the east via the 1650 mm diameter stub on quadrants eastern boundary.
Total Area to Trigoria Crescent	4.8 Ha	N/A	4.8 Ha
Avg. C	0.40	N/A	0.4
Total Area to Gerry Lalonde Drive	16.07 Ha	15.52	15.78 Ha
Avg. C	0.65	0.54 (5 Ha portion of quadrant undeveloped in calculation)	0.71
Peak Rational Method total flow to Ex. 1350mm diameter stub	1365.95 L/s (using the 85 L/s/ha reported).	778.6 L/s for the Institutional lands, and 236.8 L/s for the Medium Density block per the Avalon West (Neighbourhood 5), Western Trunk Storm Sewer and Interim Stormwater Management Report, Revision 2 (IBI Group, February 2012) and the Avalon West (Neighbourhood 5),	778.6 L/s for the Institutional lands, and 236.8 L/s for the Medium Density block per the Avalon West (Neighbourhood 5), Western Trunk Storm Sewer and Interim Stormwater Management Report, Revision 2 (IBI Group, February 2012) and the Avalon West

		Stormwater Management Facility Design, Revision 2 (IBI Group, October 2012).	(Neighbourhood 5), Stormwater Management Facility Design, Revision 2 (IBI Group, October 2012).
Major System Stormwater Management Strategy	Storage up to 100 year storm event via surface storage on roads, storage on parks, oversized storm pipe storage.	Storage up to 100 year storm event. Institutional lands to provide storage via surface and roof storage. Medium Density block to provide storage via oversized sewers and manholes and surface storage.	Storage up to 100-year storm event. Institutional lands to provide storage via surface and roof storage. Medium Density block to provide storage via oversized sewers and manholes and surface storage.

11.5.4 Consideration of Alternative Implementation Details for Servicing Designs

Stormwater sewer sizing, minor and major flow routing, and preliminary grading were reviewed as part of MSS-level servicing design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area and the predicted performance, no other logical or efficient alternative designs were advanced for additional analysis and evaluation.

11.6 Water Balance and Infiltration Measures

Per the *Existing Conditions Water Budget* (Palmer, December 2014) (***Appendix F***), pre-development infiltration rates are to be preserved for the limited exposed bedrock areas within the EUC Phase 3 CDP area. Generally speaking, the protection of the Innes Park Woods and associated buffer ensure that the infiltration rates in this area will remain unchanged. Per the *Existing Conditions Water Budget* (Palmer, December 2014), no mitigation for changes to infiltration are recommended for the area of surficial sand anticipated to be encountered near the stormwater management pond. However, as a best practice, the western part of the Significant Woodland where sand is most likely to be encountered will remain in place to promote infiltration.

As part of the development of low density and medium density residential uses, perforated pipes in rear yards are to be designed to infiltrate runoff. Additional low impact development practices may be required to be implemented in parks, institutional, commercial, and employment land use parcels, in accordance with MECP and City of Ottawa guidelines for development, where required at the time of site-specific planning.

Site-specific infiltration testing has been undertaken in the EUC Phase 3 Area CDP study area, with the purpose of refining the findings of the *Existing Conditions Water Budget* (Palmer, December 2014) and informing the proposed stormwater management plan design. The results found that while water can easily seep into the topsoil layer, the vertical movement is restricted by the low permeability of the clay soils and the perched water table; therefore, infiltration volumes for any Low Impact Development (LID) measures would be limited. Furthermore, per available groundwater and bedrock mapping (Paterson Group, July 7,

2019), parts of the study area do not meet MECP clearance from groundwater and bedrock guidelines for use of LIDs as significant components of the stormwater management system. See ***Appendix F*** for additional details.

11.7 Commitments for Detailed Design

The minor and major sewer systems and associated stormwater management facilities will be designed to support phased developments within the EUC Phase 3 Area. All proposed storm sewer infrastructure will be designed in accordance with the *Ottawa Sewer Design Guidelines*. The EUC Pond 1 North Forebays and North Main Cell modifications will be completed according to City guidelines and the *MOE SWMP Design Manual*, further detailing inlet and outlet structures, orifice sizing, and pond block design – including amenity space and multi-use pathways. Pond side slopes design is to be approved by a licensed Geotechnical Engineer prior to construction.

The proposed gravity sewer conveyance systems are shown to generally follow the proposed road network, with the exception of select conceptual servicing easements and a trunk sewer in the North West quadrant that is to run parallel to the Hydro Corridor. Note that as the road network is conceptual in nature and is subject to change. As such, the trunk storm sewer routing is also subject to change. Easements may be required to provide efficient servicing per City of Ottawa and MECP standards.

During design of the developments within the EUC Phase 3 Area:

- Average runoff coefficients will be updated to reflect detailed pervious/impervious surfaces information;
- Design parameters factors according to City of Ottawa Sewer Design Guidelines will be used;
- Local storm sewer sizing will need to be evaluated at the subdivision approval stage;
- Permissible grade raises will be further analyzed and confirmed by a licensed Geotechnical Engineer;
- Detailed storage calculations/modeling will be done to ensure storage targets are being met;
- Overland flow routes will be detailed further; and,
- Capacity in downstream infrastructure will be confirmed through storm sewer network modeling, as-builts, and rational method design information.

Of special note is the stormwater management design for the North East quadrant. Decisions related to stormwater management criteria for this area are to be subject to additional City review as part of *Planning Act* approvals for this area.

11.8 Stormwater Servicing Conclusion

The design of the storm sewer networks is in accordance with the City of Ottawa Sewer Design Guidelines. The western quadrants are tributary to the EUC Pond 1. The North West quadrant is to have its minor and major systems directed towards the North Forebays of the EUC Pond 1. A proposed expansion of the EUC

Pond 1 North Forebays and North Main Cell will adequately service the North West quadrant. The South West quadrant is to have its minor and major systems be directed to the South Forebay of the EUC Pond 1 via existing downstream infrastructure. Adequate capacity has been reserved in the downstream infrastructure for the South West quadrant's stormwater flows.

Development of the North East quadrant is currently planned to be tributary to Bilberry Creek via the existing Wildflower Drive trunk storm sewer. The quadrant is to restrict its capture rate so as to be equivalent to the capture rate considered for the area within the MSU (Stantec, July 2006), which governed the design of downstream infrastructure. As such, it is concluded that adequate capacity has been reserved in the downstream infrastructure for the North East quadrant's stormwater flows. Erosion mitigation requirements may be recommended by affected agencies for development within the North East quadrant, including potential diversion of the area south of Vanguard Drive towards McKinnon's Creek. Requirements are to be defined as part of Planning Act approvals for parcels within the quadrant, based on analyses to be undertaken at a watershed scale.

The South East quadrant is tributary to the existing Avalon West (Neighborhood 5) Stormwater Management Facility via the existing storm sewer network to the east of the quadrant. The quadrant is to restrict its release rate into the existing storm sewer within Gerry Lalonde Drive. As such, it is concluded that adequate capacity has been reserved in the downstream infrastructure for the South East quadrant's stormwater flows.

A site grading scheme has been developed to best minimize earthworks, provide major system conveyance and provide adequate cover above servicing infrastructure. Where proposed roadway grades exceed the permissible grade raise recommendations, a settlement surcharge program or lightweight fill alternatives can be further investigated as designs within the EUC Phase 3 Area subject area progress; however, it is expected that additional detailed analysis and testing will refine the grade raise restrictions included in this MSS.

The MCEA project listing for the recommended stormwater management infrastructure is provided in ***Section 13.1.***

All proposed storm sewer infrastructure is to be designed and constructed in accordance with the City of Ottawa Sewer Design Guidelines and MECP guidelines as part of detailed design associated with Planning Act applications within the EUC Phase 3 Area CDP.

12.0 UTILITY COORDINATION

Utility companies have been contacted to help identify existing infrastructure. Further coordination with utility companies is required as the development of the EUC Phase 3 Area progresses to confirm that the existing utility infrastructure will be sufficient to provide a means of servicing the proposed concept plan via extensions and upgrades.

Hydro One has a utility corridor running southwest-northeast through the study area. Hydro One's electrical servicing distribution area is for the lands east of Mer Bleue Road. Mer Bleue is the dividing boundary between Hydro Ottawa and Hydro One service areas.

The eastern quadrants are expected to be serviced by existing Hydro One infrastructure on Mer Bleue Road, Brian Coburn Boulevard and off of existing adjacent developments.

The western quadrants are expected to be serviced by existing Hydro Ottawa infrastructure on Renaud Road, Mer Bleue Road, Innes Road, Pagé Road and off of existing adjacent developments.

Enbridge Gas has indicated that there is infrastructure surrounding the EUC Phase 3 Area development. Natural gas service to the EUC Phase 3 Area lands will be via extensions of these systems. A summary of infrastructure adjacent to the study area follows:

- Innes Road – 8" high pressure main;
- Renaud Road – 2" intermediate pressure main;
- Mer Bleue Road – 4" high pressure main;
- Lanthier Drive – 4" intermediate pressure main;
- Vanguard Drive – 3" intermediate pressure main; and,
- Brian Coburn Boulevard (east of Mer Bleue) – 6" intermediate pressure main.

Bell Canada has advised that they have underground and overhead infrastructure along Mer Bleue Road, Innes Road and Tenth Line Road. Overhead installations are present along Pagé Road and Renaud Road.

Rogers Communications has underground and overhead infrastructure along Innes Road, Mer Bleue Road, overhead infrastructure along Pagé Road and Renaud Road, and underground on Brian Coburn Boulevard.

All utility extensions and phasing are to be addressed as development applications advance within the EUC Phase 3 CDP area.

13.0 IMPACT ASSESSMENT AND MITIGATION MEASURES

13.1 MCEA Project Schedule Listing

The anticipated undertakings within the study area are:

- Various road construction projects (various up to **Schedule C**, see Master Transportation Study (Castleglenn, May 2019).
- Construction of local roads. The local roads will be required as Conditions of Approval on future Site Plans/ Plans of Subdivision which will come into effect under the Planning Act prior to the construction of the road **(Schedule A)**.
- Establish a stormwater collection system, and undertake all necessary works to connect the systems to the existing stormwater outlets at (i) the Chaperal development, (ii) the Bilberry Creek Industrial Park's Wildflower Drive Outlet, (iii) EUC Pond #1 North Forebay and (iv) future trunk sewers within the Trailsedge development area (tributary to EUC Pond #1 South Forebay). The stormwater collection system may be completed in advance of the Plan of Subdivision process as an extension of a sewage collection system where such facilities are not in an existing road allowance or an existing utility corridor **(Schedule B).** Expansion of the existing EUC Stormwater Management Pond #1 North Cell and North Forebay which may be completed in advance of the Plan of Subdivision process as an enlargement of a stormwater pond at substantially the same location where additional property is required **(Schedule B)**.
- Establish a wastewater sewage collection system and undertake all necessary works to connect the system to the existing sewage outlets within (i) the Chaperal Development, (ii) the Bilberry Creek Industrial Park outlet to Tenth Line Road, (iii) the Orléans Village outlet to Pagé Road and (iv) future trunk sewers within the Trailsedge development area. The wastewater collection system may be completed in advance of the Plan of Subdivision process as an extension of a sewage collection system where such facilities are not in an existing road allowance or an existing utility corridor **(Schedule B).**
- Establish a water distribution system and undertake all necessary works to connect the systems to the existing watermains on Mer Bleue Road, Frank Bender Street, Vanguard Drive, Innes Road, Gerry Lalonde Drive, within the existing Hydro One corridor, and future watermain within the Trailsedge development area. The watermains may be completed in advance of the Plan of Subdivision process as an extension of a water distribution system where such facilities are not in an existing road allowance or an existing utility corridor **(Schedule B).**

Details of the servicing projects are included within this MSS. Details of the transportation projects are included in the MTS (Castleglenn, May 2019). Please note that the City of Ottawa is currently undertaking a separate Environmental Assessment for the Vanguard Drive Extension east of Mer Bleue Road. Coordination between the Environmental Assessment for the Vanguard Drive Extension and the EUC Phase 3 Area CDP has been integrated into this MSS.

13.2 Mitigation Measures

Mitigation measures - including planning decisions, design features, construction requirements, and construction constraints - will be employed to reduce potential project impacts on the environment. Based on direction from Morrison Hershfield (2018), the following mitigation measures and Best Management Practices, among others, will be brought forward as part of the project implementation:

- Completion of an updated Environmental Impact Statement (EIS) prior to construction, if required;
- Air Quality and Noise Complaints Protocol;
- Erosion and Sediment Control Plan;
- Construction and Traffic Management Plan;
- Emergency Response Plan;
- Environmental Protection Plan;
- Landscape Plan.
- Slope Stability Management Plan;
- Waste and Contaminated Materials Management Plan; and,
- Well Decommissioning Plan.

13.2.1 Snake Crossing Tunnels

The rock barren surrounding the Innes Park Woods is considered a Significant Wildlife Habitat. Garter snakes, eastern ribbon snakes, and copperbelly water snakes were identified in the area. Seeing as the extension of Frank Bender Street is proposed to run through the rock barren, snake crossing tunnels have been provided to allow for the snakes to travel freely within the rock barren without having to cross the road surface.

Three snake crossing tunnels are proposed underneath Frank Bender Street. The crossings are to be separated by 20-30 m, 24 m long to cross the ROW and have a height of opening of 0.5-0.9 m. Smooth concrete retaining walls are to direct snakes to the crossings. See ***Figure 4*** for details. Note that dimensions and spacing of tunnels are subject to change as the detailed design of Frank Bender Street and the neighbouring areas advances.

Based on the sizing and elevations of the snake crossing tunnels, the proposed watermain within Frank Bender Street may require insulation when crossing the tunnels. Details of the insulation, if required, are to be determined as the detailed design of Frank Bender Street advances.

13.2.2 Species at Risk

Based on the results of the field investigations, Morrison Hershfield (2018) have identified the follow SAR: Bobolink, Least Bittern, Barn Swallow, Eastern Wood Pewee, Bank Swallow, Wood Thrush and Eastern

Meadowlark. The recommendations in ***Table 27*** identify the suggested mitigation measures, as well as potential permitting requirements.

Table 27: Species at Risk Mitigation Measures and Permitting Requirements (Morrison Hershfield/Fotenn, Oct 2019)

Constraint (Feature or Species)	Guiding Policies	Significance/ Rationale	Recommendations
Bobolink	Provincially and Federally Threatened Species (COSSARO,2017; COSEWIC, 2017) Protected under the Ontario Endangered Species Act (2007) and Migratory Birds Convention Act (Gov. Canada, 1994). Habitat protected under the City of Ottawa Official Plan (2003) Sections 2.4.2 and 4.7.4	Identified in Community 1 south of Community 9	Prior to development at the Environmental Impact Statement (EIS) stage a qualified biologist should reassess the property for bobolink habitat. If habitat exists discussions with the Ministry of Natural Resources and Forestry (MNRF) should occur to decide the best course of action and requirements under the Endangered Species Act. A SAR permit may be required from Ministry of the Environment, Conservation, and Parks (MECP) if bobolink still exists within the field meadows. Possible compensation required on-site or off-site if removal of habitat is needed and detailed mitigation measures to be developed. Site preparation activities, no clearing to occur within the peak breeding bird period (April 15th to August 15th) as per Environment Canada

Least Bittern	Provincially and Federally Threatened Species (COSSARO, 2017; COSEWIC, 2017) Protected under the Ontario Endangered Species Act (2007), Species at Risk Act and Migratory Birds Convention Act (Gov. Canada, 1994). Habitat protected under the City of Ottawa Official Plan (2003) Sections 2.4.2 and 4.7.4	One individual identified in Community 9	Prior to development at the EIS stage a qualified biologist should reassess the property for least bittern habitat. If habitat exists discussions with MNRF should occur to decide the best course of action and requirements under the Endangered Species Act. Endangered Species Act permit may be required from MECP if least bittern still exists within the storm water pond prior to construction. Possible compensation required if removal of habitat is needed and detailed mitigation measures to be developed. No clearing to occur within the peak breeding bird period (Mid-April to end of August) as per Environment Canada. If dredging or other works are proposed in this pond, MNRF and MECP should be contacted regarding the need for permits under the Endangered Species Act.
Barn Swallow	Provincially and Federally Threatened Species (COSSARO, 2017; COSEWIC, 2017) Protected under the Ontario Endangered Species Act (2007) and Migratory Birds Convention Act (Gov. Canada, 1994). Habitat Protected under the City of Ottawa Official Plan (2003) Sections 2.4.2 and 4.7.4	Several individuals identified foraging over a snow dump pile in Community 1 on the northwest limits of the study property.	No further action is required. Only nests on structures are protected. Currently no structures with active barn swallow nests in Study Area. The presence/absence barn swallow nests should be conducted prior to removal of any potential barn swallow nesting structures.

Eastern Wood-pewee	Federally and provincially a special concern species (COSEWIC, 2017; COSSARO, 2017) Protected under Migratory Birds Convention Act (Gov. Canada,1994) and the Significant Wildlife Habitat Technical Guide (MNR, 2000) Habitat protected under the City of Ottawa Official Plan (2003) Sections 2.4.2 and 4.7.8	Identified in Community 8	Prior to development at the EIS stage a qualified biologist should reassess the property for eastern wood-pewee habitat. Protect the entire UNF (Innes Park Woods UNA). Special concern species covered under Significant Wildlife Habitat policies in PPS and City of Ottawa Official Plan. Forest to be preserved, no tree cutting.
Bank Swallow	Federally and provincially threatened species (COSEWIC, 2017; COSSARO, 2017) Protected under the Migratory Birds Convention Act (Gov. Canada, 1994) Habitat Protected under the City of Ottawa Official Plan (2003) Sections 2.4.2 and 4.7.4	Birds identified foraging over the property (north-west corner of Community 1 over a snow dump), no nesting habitat identified.	Currently no nesting colonies present, therefore no action under the ESA is required. Prior to development at the EIS stage a qualified biologist should reassess the property for bank swallow habitat. As these birds are opportunistic and can use temporary storage piles as nesting sites, the presence of suitable habitat and colonies should be assessed at the EIS stage. City of Ottawa Recommendation: site specific mitigation measures are needed regarding storage of topsoil/fill/etc. on-site, to avoid potential issues.

Wood Thrush	Federally threatened species (COSEWIC, 2017) and a special concern species provincially (COSSARO, 2017) Protected under the Migratory Birds Convention Act (Gov. Canada,1994) and the Significant Wildlife Habitat Technical Guide (MNR, 2000) Habitat protected under the City of Ottawa Official Plan (2003) Sections 2.4.2 and 4.7.8.	Identified in Community 8	Protect the entire Urban Natural Feature (UNF) (Innes Park Woods). Special concern species covered under Significant Wildlife Habitat policies in PPS and City of Ottawa Official Plan. Prior to development at the EIS stage a qualified biologist should reassess the property for wood thrush habitat. No cutting of forest permitted until this is completed.
Eastern Meadowlark	Federally and provincially threatened species (COSEWIC, 2017; COSSARO, 2017) Protected under the Ontario Endangered Species Act (2007) and Migratory Birds Convention Act. Habitat protected under the City of Ottawa Official Plan (2003) Sections 2.4.2 and 4.7.4.	Identified in Community 14	Prior to development at the EIS stage a qualified biologist should reassess the property for eastern meadowlark habitat. Permit required from MECP under the Endangered Species Act if eastern meadowlark still exists within the field meadows. Discussions with the MNRF may be required. Possible compensation required if removal of habitat is needed. No clearing to occur within the breeding bird period (April 15th to August 15th) as per Environment Canada.

13.3 Impact Assessment

Table 28 provides a summary of the potential servicing activities during the construction period for the various servicing EA projects within the CDP area. For each activity identified, potential mitigation and monitoring measures are provided, along with the significance of the impact. The analysis was based primarily on comparing the existing environment with the anticipated future environment, during and after construction. Consideration was given to the magnitude, spatial extent, and duration of effects. Because the proposed servicing infrastructure often follows the road network, the projects and mitigation measures described in the MTS (Castleglenn, May 2019) ought to be read alongside the activities listed in ***Table 28.***

Under the direction of Morrison Hershfield (2018), the project impact/activities were assessed in terms of their significance and are categorized according to the following:

- **Negligible** – Means nearly zero or hardly noticeable effect; this could affect a specific group of individuals within a localized area and/or over a short period.
- **Insignificant** - Could mean one of the following:
    - Not widespread;
    - Temporary or short-term duration;
    - Affecting a specific group of individuals or community within a localized area; and,
    - Not permanent and after project activity is complete, the integrity of the system would resume.
- **Significant** - Could mean one of the following:
    - Widespread;
    - Permanent or breach of standards, policies or guidelines, etc.; and,
    - Permanent impact on environmental, underground services, archaeological/heritage resources, community character, land use patterns, etc.

Table 28: Master Servicing Study Projects – Impacts, Mitigation, and Monitoring (Morrison Hershfield & DSEL, Oct 2018)

Criteria	Project Activity/Impact	Mitigation Measures	Monitoring	Impact
Air Quality	Construction activities may create dust.	Control of dust and debris will be the responsibility of the Contractor and will be managed through construction specifications.	Construction monitoring	Insignificant
Wildlife	Clearing and grubbing and other onsite construction activities associated with the development plan and associated roads and services may impact general wildlife and habitat.	Site specific Protocol for Wildlife Protection to be developed prior to construction and will be managed through construction specifications.	Construction monitoring	Insignificant

Species at Risk	Construction activities may impact SAR wildlife and habitat.	See ***Table 27.***		Insignificant
Wildlife & Watercourses	Closure of select headwater features (not protected under the site-specific headwater assessment report) and modifications to EUC Pond 1 may impact wildlife and habitat.	City and other affected agencies to be consulted at the time of detailed design to determine construction staging requirements. In-water work plans (e.g. defishing plans, isolation areas, etc.) will require review by Conservation Authorities/DFO and will be managed through construction specifications.	Construction monitoring	Insignificant
Wildlife & Watercourses	Uncontrolled erosion, sedimentation, and machine use during construction could result in loss of topsoil and release of deleterious materials into watercourses.	Erosion and sediment control plan to be developed prior to construction and will be managed through construction specifications.	Construction monitoring	Insignificant
Wildlife & Watercourses	Dewatering is anticipated to be required during construction of the development plan and associated roads and services, including for expansion of EUC Pond 1 North Main Cell and North Forebay.	A dewatering plan will be prepared, and dewatering will be managed through the MECP Permit To Take Water process.	Construction monitoring	Insignificant
Tree Removal	Tree removal associated with	Tree clearing to be managed	Construction monitoring	Insignificant

	development plan and associated roads and services, including tree removal for expansion of EUC Pond 1 North Main Cell and North Forebay.	through City of Ottawa permitting system. Areas to be protected to be delineated onsite, and to be managed through construction specifications.		
Significant Wildlife Habitat	Construction of the development plan and associated roads and services requires crossing of Significant Wildlife Habitat associated with snake habitat near Innes Park Woods	City and other affected agencies to be consulted at the time of detailed design to determine construction staging requirements/work plans, and will be managed through construction specifications. Crossing tunnels for snakes to be incorporated into road design, see ***Section 13.2.2***	Monitor effectiveness of mitigation as required.	Insignificant

The list provided in ***Table 28*** is high-level and should be further refined in detail for each phase of the development during the *Planning Act* approval process (e.g. site plan / plan of subdivision). Developers would need to work with City of Ottawa staff prior to construction start-up to identify requirements and develop proper management plans.

13.4 Permitting & Environmental Mitigation

Community Design Policies and Guidelines in the CDP (Fotenn, October 2019) provide a framework for the overall identity and structure of the CDP area, as well as for the characteristics of new buildings, streetscapes, and parks within the community. Their purpose is to ensure a consistently high-quality design standard throughout the community. These policies and guidelines have been developed within an environmental context and contain guidance related to: noise control, visual conformity and design aesthetics, transit infrastructure, multi-modal transportation, streetscaping, vegetation planting, use of existing natural elements and greenspace planning, and stormwater management policies and guidelines.

The environmental permits and approvals involved in the next steps of the area development and the associated responsibilities are outlined in ***Table 29***. Additional details regarding permitting and approval requirements specific to the servicing infrastructure in the MSS are described in ***Section 13.4.1***.

Table 29: Environmental Permits and Approvals (Morrison Hershfield, 2018)

Action	Responsibility	Timing/Process/Permits and Approvals
Woodlands and Forests - Review recommendation for retention of woodlots / trees and incorporation into Parkland.	City of Ottawa	Parks Master Plan
Tree Conservation Report (TCR) and Landscape Plan - Address opportunities for tree retention in high quality woodlots, specimen trees. Consider transplanting where appropriate. - Provide tree planting recommendations to achieve 30% tree canopy in new parks and to enhance urban forest and canopy cover throughout the community, using native species.	Developers	Plan of Subdivision Endangered Species Act Urban Tree Conservation By-law
Environmental Impact Statement - Complete EIS to confirm presence of known or potential SAR, extent of any SAR habitat, and associated mitigation / compensation requirements. - If necessary, obtain SAR permit from the Ministry of Natural Resources and Forestry for bobolink, least bittern, eastern meadowlark, and/or barn swallow.	Developers	Plan of Subdivision Endangered Species Act Environment Impact Statement
Wildlife Protection - Develop site specific Protocol for Wildlife Protection.	Developers	Plan of Subdivision City of Ottawa Protocol for Wildlife Protection
Water and Sewer - Apply for Environmental Compliance Approval (ECA) from the Ministry of the Environment, Conservation and Parks.	Developers	Plan of Subdivision Environmental Protection Act Environmental Compliance Approval (ECA) MECP
Permit to Take Water (PTTW) - Apply for Permit to Take Water if more than 4000,000 l/day or registration on the Environmental Activity and Sector Registry (EASR) if between 50,000 to 400,000 l/day.	Developers	Ministry of the Environment, Conservation and Parks Ontario Water Resources Act (OWRA) Water Taking Regulation (O. Reg. 387/04)
Previous Land Uses - Decommission wells - Remove agricultural tile drains. - Remove septic systems.	Developers	Environmental Protection Act Ontario Water Resources Act
Headwater Drainage Features - Implement the recommendations of the Headwater Drainage Features report prepared by Niblett (March 28, 2018) & Kilgour (July 2017).	Developers	Consult with Conservation Authorities

13.4.1 Master Servicing Study Process and Approval Requirements

The City of Ottawa will consider this MSS for approval under the Official Plan Amendment process. City approval is required prior to the development of any servicing infrastructure recommended in this report. The MSS will also be made available for public review in accordance with the requirements of the MCEA.

The following additional approvals and permits could be expected to be required prior to construction of the municipal infrastructure detailed herein. Please note that other permits and approvals may be required, as detailed in ***Section 14*** and in the other studies submitted as part of the *Planning Act* development applications (e.g. Tree Conservation Report, Environmental Impact Statement, Phase 1 Environmental Site Assessment, etc.).

Permitting and approval requirements may change over time. It is expected that all permitting and approval requirements will be confirmed at the time of detailed design and construction for any servicing infrastructure recommended in this report.

13.4.1.1 Ministry of the Environment, Conservation and Parks (MECP)

The MECP is required to review detailed engineering designs and issue Environmental Compliance Approvals (ECA) for sanitary sewers, storm sewers, any new or modified stormwater management facilities, and detailed stormwater management plans prior to the development of servicing infrastructure. Some of the proposed infrastructure may be approved through the City of Ottawa's and MECP's Transfer of Review Agreement (e.g. storm and sanitary sewers). Any proposed modifications to the existing stormwater management facility adjacent to the EUC Phase 3 CDP area – EUC Pond 1 – would be expected to be subject to direct submission to the MECP, given the pond provides Normal protection for quality control (e.g. only Enhanced protection works are currently subject to the City of Ottawa's Transfer of Review Agreement with the MECP).

The City of Ottawa is expected to review any proposed watermains on behalf of the MECP through the Form 1 – Record of Watermains Authorized as a Future Alteration.

Pumping of groundwater or surface water may be required to allow for construction of proposed land uses (e.g. basements for residential homes) and any proposed services. The MECP may be required to review a Permit To Take Water in support of the proposed development and associated municipal infrastructure.

13.4.1.2 Rideau Valley Conservation Authority (RVCA) & South Nation Conservation (SNC)

Concurrent with City and MECP approvals, approvals and permits may be required from the RVCA and SNC as per Ontario Regulation 174/06 and Ontario Regulation 170/06 – Development, Interference with Wetlands and Alterations to Shorelines and Watercourses, including for approval for closure of existing headwater features within the EUC Phase 3 Area CDP.

13.4.1.3 Hydro One

Proposed land uses and municipal infrastructure adjacent to or within the Hydro One corridor will require specific approvals and agreements from Hydro One (and/or other parties that Hydro One indicates). Approval requirements may include secondary land use agreements for multiuse pathways.

13.4.1.4 Private Landowners

Any proposed construction activities and/or permanent infrastructure beyond the subject lands may trigger legal agreements, such as permissions, access licenses, occupation licenses, and/or legal property instruments.

14.0 IMPLEMENTATION OF THE MASTER SERVICING PLAN

Front-ending agreements, development charge recovery, cost sharing agreements, and private funding are all tools that are expected to be employed to construct the infrastructure identified in this report. A Financial Implementation Plan will be prepared to further detail the planned implementation strategies.

Lands within the EUC Phase 3 CDP area are expected to be dedicated to the City via rights-of-way and easements, so that the identified infrastructure would become City-operated and City-maintained. The proposed expansion of the stormwater management facility will require additional lands to be dedicated to the City, beyond their current land holdings at EUC Pond 1.

14.1 Process for Amending the Master Servicing Study

Master Plans, by MCEA definition, are long range plans which integrate infrastructure requirements and future land uses. Over time, due to unforeseen circumstances, it may not be feasible to implement the projects as described in the CDP or Master Plans/EAs. Significant or major changes to the project, or change in the environmental setting, will need to be reviewed and a determination made as to whether an addendum to the Master Plan Projects is required.

Major Changes would be considered to be those which change the intent of the EAs or appreciably change the expected net impacts or outcomes associated with the project. An example of a major change would result from a proposed major shift in a preferred design alignment or configuration which would warrant changes in mitigation as described in the EA. If the proposed modification is major, an addendum to the Master Plans may be required to: document the change; identify the associated impacts and mitigation measures; and allow related concerns to be addressed and reviewed by the appropriate stakeholders and public.

Minor design changes are considered to be changes which do not appreciably change the expected net impacts or outcomes associated with the project. The majority of such changes could be dealt with during the detailed design and development approvals phase and would remain the responsibility of the proponent to ensure that all relevant issues are taken into account. For example, a design change in lighting treatment, landscaping, noise attenuation, median width, pathway connections, underground infrastructure sizes, changes in sanitary/stormwater outflows, and changes in water demands could be considered minor. A change would also be considered as minor if it is required to comply with another Act, a regulation made under another Act, an order, permit, approval or other instrument issued under another Act, or if required to comply with the requirements of approval authorities such as the City of Ottawa or Conservation Authorities. Changes in infrastructure alignment or facility footprints or tributary areas would also be considered as minor if they do not affect non-consenting landowners and do not warrant changes in mitigation as described in the EA.

15.0 CONCLUSION

Richcraft Homes, on behalf of the East Urban Community (EUC) Phase 3 Area Community Design Plan (CDP) land owners, has retained **David Schaeffer Engineering Ltd.** (DSEL) to prepare a Master Servicing Study (MSS) as supporting information for an Official Plan Amendment application to support the development of the EUC Phase 3 Area CDP lands. The MSS includes the following contributions: Environmental Assessment input provided by **Morrison Hershfield**, stormwater management analysis provided by **J.F. Sabourin and Associates Inc.**, watermain analysis provided by **GeoAdvice Engineering Inc.**, geotechnical and hydrogeological investigations completed by **Paterson Group Inc.**, hydrogeological investigations and water budget analysis completed by **Palmer Environmental Consulting Group Inc.,** natural environment investigations completed by **Niblett Environmental Associates Inc.,** and natural environment and geotechnical investigations around an existing stormwater facility adjacent to the CDP study area by **Kilgour & Associates Ltd.** and **Golder Associates Ltd.**, respectively.

The principal conclusions of this study are as follows:

1) The City of Ottawa, RVCA, SNC, other agencies, Indigenous Groups, and the public have been consulted concerning the proposed development plan and associated servicing plan.

2) Sufficient background research and analysis have been completed to support the proposed development plan, including a detailed inventory of existing environmental conditions.

3) Various concept plans have been created and evaluated using environmental assessment principles.

4) A preferred development concept plan has been selected for the proposed development, based on refinements recommended as part of the consultation program.

5) Expanding the existing municipal water system is the preferred solution for water distribution for the proposed developments in the EUC Phase 3 Area CDP.

6) Expanding the existing municipal wastewater system is the preferred solution for wastewater collection for the proposed developments in the EUC Phase 3 Area CDP.

7) A treatment train consisting of lot/block and right-of-way controls, minor/major collection systems, and expansion of the existing EUC Pond 1 is the preferred solution for stormwater management for the proposed developments in the EUC Phase 3 Area CDP.

8) The North West quadrant's water servicing strategy is as follows: 300 mm diameter trunk watermains running through the quadrant, connecting to a 400 mm diameter watermain on Mer Bleue Road, a 400 mm diameter watermain on Innes Road, a 300 mm diameter watermain on Frank Bender Street, and a 600 mm diameter watermain within the Hydro Corridor.

9) The North East quadrant's water servicing strategy is as follows: 300 mm diameter trunk watermains running through the quadrant, connecting to a 400 mm diameter watermain on Mer Bleue Road, a 600 mm diameter watermain on Innes Road, and a 300 mm diameter watermain on Vanguard Drive.

10) The South West quadrant's water servicing strategy is as follows: 200 mm and 300 mm diameter watermains connecting to the existing 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road, via the proposed watermain network to the south of the quadrant. The portion of the quadrant west of Fern Casey Street is to be serviced by an existing 200 mm diameter stub off of Axis Way.

11) The South East quadrant's water servicing strategy is as follows: a 200 mm diameter looped watermain which will be connected to the existing 400 mm diameter watermain on Brian Coburn Boulevard and the 400 mm diameter watermain on Gerry Lalonde Drive.

12) The water servicing strategies for all quadrants were incorporated into a model that indicates that the proposed watermain network can provide domestic flows to the subject area with service pressures within the acceptable range, and can provide the anticipated required high-level fire flow of 250 L/s at all modelled nodes.

13) The North West quadrant's wastewater servicing strategy is as follows: the quadrant is to be serviced by the Forest Valley Trunk Sewer at Pagé Road and Nature Trail Crescent (fv07700), via a network of 250 mm-600 mm diameter sanitary sewers.

14) The North East quadrant's wastewater servicing strategy is as follows: the quadrant is to be serviced by the Tenth Line Pump Station and the 525 mm diameter trunk sewer on Tenth Line Road via the 250 mm-525 mm diameter trunk sewer on Vanguard Drive.

15) The South West quadrant's wastewater servicing strategy is as follows: the quadrant is to be serviced by the Forest Valley Pump Station and the existing 600 mm diameter sewer on Renaud Road via the existing sanitary sewer network to the south west of the quadrant.

16) The South East quadrant's wastewater servicing strategy is as follows: the quadrant is to be serviced by the Tenth Line Pump Station and the existing sewer network to the east, via the 300 mm diameter stub on the quadrant's eastern boundary.

17) The North West quadrant's stormwater management strategy is as follows: the quadrant's lands and future commercial lands to the north are to be serviced by an internal trunk storm sewer network consisting of two main trunk sewers. Trunk sewers (max 2700mm dia) discharge into one of two forebays proposed as part of an expansion of EUC Pond 1. Employment blocks, medium density residential blocks, medium-high density residential blocks, parks, and external commercial lands are to provide onsite storage up to the 100-year storm event. Overland flow is to be stored within road network, then directed towards the EUC Pond 1, partially through Hydro corridor.

18) The North East quadrant's stormwater management strategy is as follows: the quadrant may be serviced by an internal trunk storm sewer network running through the existing storm network to the north of the quadrant, then to the 1800 mm diameter Wildflower Drive sewer, before ultimately draining into Bilberry Creek. Onsite storage and road sags would be required to meet the required stormwater release rates. Storage is to be provided within quadrant up to 100-year storm event. Additional stormwater control measures may be required for erosion protection as part of detailed design, according to future City and RVCA recommendations, including potential storage & diversion towards McKinnon's Creek (via existing infrastructure) for the lands south of Vanguard Drive.

19) The South West quadrant's stormwater management strategy is as follows: the quadrant is to be serviced by trunk storm sewers running through southern adjacent lands to a stormwater conveyance channel that ultimately discharges to the South Forebay of EUC Pond 1. Onsite storage up to the 100-year storm event is to be provided for mixed use and commercial land uses. Overland flow is to be stored within road network, then directed towards EUC Pond 1.

20) The South East quadrant's stormwater management strategy is as follows: the quadrant is to be serviced by the Neighborhood 5 Cumberland East Urban Community stormwater management pond and the existing sewer network to the east, via the 1650 mm diameter stub on the quadrant's eastern boundary. Storage is to be provided up to the 100-year storm event. Institutional lands are to provide storage via surface storage and roof storage. The Medium Density block is to provide storage via the existing oversized sewer system and surface storage.

21) The North Main Cell and North Forebay of the existing EUC Pond 1 are to be expanded to provide additional storage in support of development within the EUC Phase 3 Area CDP. The expansion incorporates setbacks from existing headwater features and protection of the existing Significant Woodland adjacent to the stormwater management facility. The proposed pond expansion is in conformance with all operational requirements presented in City of Ottawa guidelines, the MECP SWMP Design Manual, and governing studies for EUC Pond 1. Improvements to the current pond outlet may be recommended via the City of Ottawa's *Mud Creek Cumulative Impacts Study* (ongoing). While the pond as a whole has been designed for Normal protection (70% average long-term total suspended solids removal), the expanded North Main Cell and North Forebays have been designed so as to provide Enhanced (80% average long-term total suspended solids removal) for those flows being treated by the North Forebays.

22) A preliminary Hydraulic Grade Line (HGL) analysis was completed for the storm sewer network in the North West and South West quadrants. The simulated 100-year HGL results through the proposed trunk storm sewer network are appropriate given the proposed road grades and anticipated underside of footing elevations.

23) A grade raise restriction of 0.5 m to 1.5 m applies for the South West and South East quadrants, as well as the southern portions of the North West and North East quadrants. A grade raise restriction of 2 m was recommended for the northern portions of the North West and North East quadrants. Seeing as portions of the EUC Phase 3 Area CDP are proposed to be higher than the grade raise restrictions, additional studies are recommended to refine the grade raise recommendations. A surcharge program or lightweight fill program may be required to support the development, to the satisfaction of a licensed Geotechnical Engineer in Ontario.

24) Utility companies have been contacted to help identify existing utility infrastructure. Further coordination with utility companies is required to confirm that the existing utility infrastructure will be sufficient to provide a means of servicing the proposed concept plan via extensions and upgrades.

25) Three snake crossing tunnels are proposed underneath the extension of Frank Bender Street to allow for snakes to travel within the rock barren without having to cross the road surface. The

stormwater management strategy for the EUC Phase 3 Area CDP has been designed to maintain existing drainage patterns in the vicinity of the rock barren.

Within this MSS, existing municipal water and wastewater systems are found to have adequate capacity to expand to accommodate the water demands and wastewater flows from the EUC Phase 3 Area CDP. A treatment train consisting of lot/block and right-of-way controls, minor/major collection system, and expansion of the existing EUC Pond 1 is found to have adequate capacity to accommodate stormwater flows from the EUC Phase 3 Area CDP. While all existing and proposed infrastructure is found to have capacity to service the proposed developments within the EUC Phase 3 Area CDP, refinements to the proposed development and associated servicing are anticipated at the future detailed design stage.

The preceding MSS has been prepared to provide sufficient detail to support *Planning Act* and *Environmental Assessment Act* approval to proceed with the planned development in accordance with the servicing recommendations. The proposed servicing projects fall under Schedule A and Schedule B of the *Municipal Class Environmental Assessment* (Municipal Engineer's Association, October 2000, as amended in 2007, 2011 & 2015). Additional detailed design work, permitting, and approvals are required before any infrastructure identified in this MSS can be constructed.

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