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SERVICING BRIEF

FOR

CARDINAL CREEK VILLAGE PHASE 8

TAMARACK (CARDINAL CREEK) CORPORATION

CITY OF OTTAWA

PROJECT NO.: 25-1480

**JULY 17TH, 2026
1ST SUBMISSION
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SERVICING BRIEF FOR CARDINAL CREEK VILLAGE PHASE 8

TAMARACK (CARDINAL CREEK) CORPORATION

PROJECT NO: 25-1480

1.0 INTRODUCTION

This Servicing Brief pertains to Phase 8 of the Cardinal Creek Village (CCV) development in the east end of the City of Ottawa.

As illustrated in **Figure 1**, the Phase 8 subject lands are located southeast of Famille-Laporte Avenue, southwest of Géographe Terrace, northwest of Mishawashkode Street and northeast of Cartographe Street. The subject lands are municipally addressed as 1213 Old Montreal Road, within the former Municipality of Cumberland.

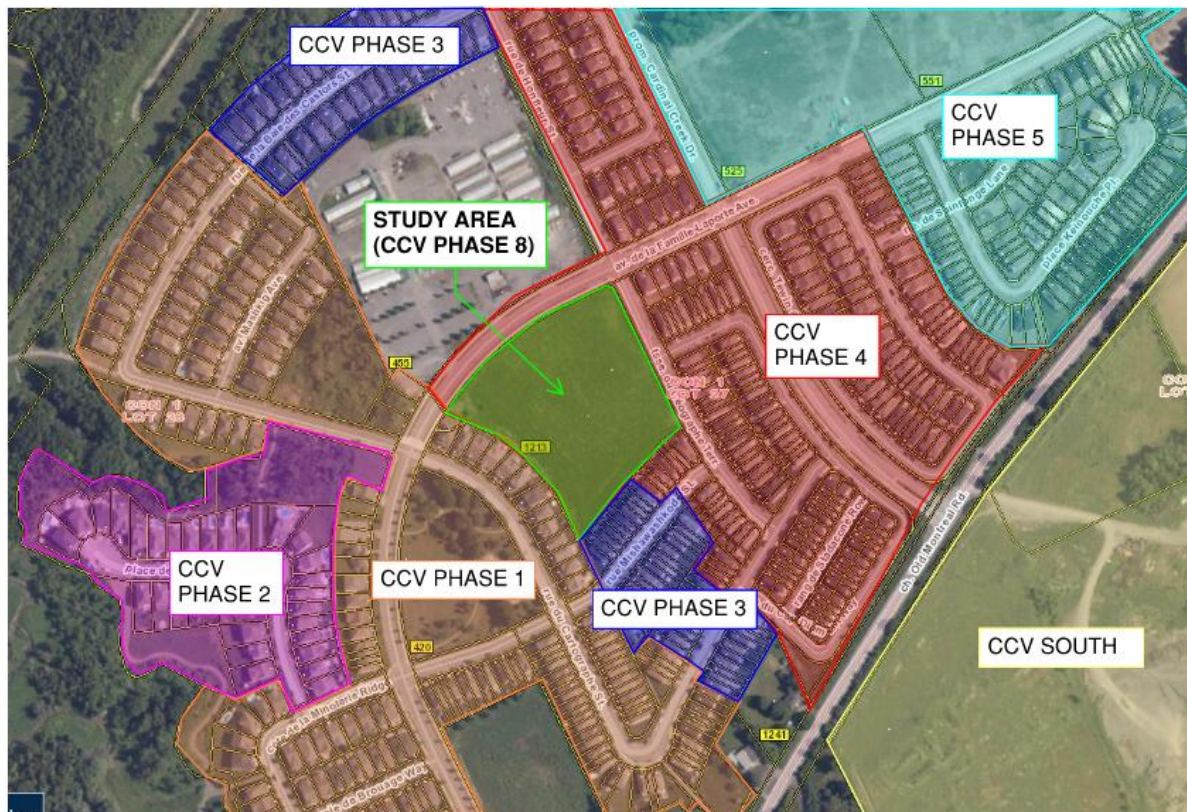


Figure 1: Site Location

This Servicing Brief is submitted to the City of Ottawa on behalf of Tamarack (Cardinal Creek) Corporation and provides water, sanitary sewer, stormwater management, and grading design information to support the development of 47 residential units. It is to be read in conjunction with the detailed engineering drawing package for Phase 8 prepared by DSEL dated July 13, 2026.

This Servicing Brief and engineering submission have been prepared by **David Schaeffer Engineering Ltd.**, with stormwater management analysis provided by **J.F. Sabourin and Associates Inc.**, watermain analysis provided by **GeoAdvice Engineering Inc.**, and geotechnical analysis provided by **Paterson Group Inc.**

1.1 Background

Phase 8 of the Cardinal Creek Village development occupies lands that were previously identified as a future school block in the Cardinal Creek Village Master Servicing Study (DSEL, July 2013) and Functional Servicing Report (DSEL, September 2013). More recently, the detailed design for the former Phase 4 school block was presented in the Design Brief for Cardinal Creek Village Phase 4 (DSEL, September 2017), and the approved engineering drawings dated May 15, 2018.

Excerpts from the approved Phase 4 engineering drawings, as well as the Environmental Compliance Approval (ECA No. 7792-ASJR4M, issued October 31, 2017), are provided in **Appendix B** for reference.

A pre-consultation meeting was held with the City of Ottawa on May 8, 2026. The pre-consultation meetings notes are provided in **Appendix B**.

1.2 Development Concept

The proposed development concept for CCV Phase 8 is shown in the draft 4-M plan included in **Appendix A** and consists of one single detached unit and 46 semi-detached units. The projected populations associated with Phase 8 of the development are described in **Table 1.1** below.

Table 1.1: CCV Phase 8 Development Statistics

Land Use	Total Area (ha)	Projected Residential Units	Residential Population per Unit*	Projected Population
Residential	2.09	1	3.4	4
		46	2.7	125
Total	2.09	47	-	129

** NOTE: Population projections may differ from population estimates used in background Transportation Studies, Planning Rationale, and other 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 the Total Area estimates above.*

The proposed road within Phase 8 has an 18.0 m Right-of-Way (ROW). The proposed ROW cross-section can be found in ***Drawing 2***.

1.3 Required Permits / Approvals

Development of the study area is expected to be subject to the following permits and approvals presented in ***Table 1.2***.

Table 1.2: Required Permits and Approvals

Agency	Permit/Approval Required	Trigger	Remarks
MECP/City of Ottawa	Consolidated Linear Infrastructure - Environmental Compliance Approval (CLI-ECA)	Construction of new sanitary and storm sewers.	The City of Ottawa is expected to review all stormwater collection systems, stormwater management, and wastewater collection systems on behalf of the MECP as part of the CLI-ECA program.
MECP/City of Ottawa	MECP Form 1 – Record of Watermains Authorized as a Future Alteration.	Construction of watermains.	The City of Ottawa is expected to review the watermains on behalf of the MECP through the Form 1 – Record of Watermains Authorized as a Future Alteration.
City of Ottawa	Commence Work Notification (CWN)	Construction of new sanitary and storm sewers throughout the subdivision.	The City of Ottawa will issue a commence work notification for construction of the sanitary and storm sewers once the proposed works have been added to the City's CLI-ECA.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following studies were utilized in the preparation of this report.

- **Ottawa Sewer Design Guidelines**
City of Ottawa, SDG002, December 23, 2025
(Sewer Design Guidelines)
- **Ottawa Design Guidelines – Water Distribution**
City of Ottawa, December 8, 2025
(Water Supply Guidelines)
- **Stormwater Management Planning and Design Manual**
Ministry of Environment, March 2003
(SWMP Design Manual)
- **Design Guidelines for Sewage Works**
Ministry of the Environment, 2008.
(MECP Design Guidelines)
- **Ontario Building Code Compendium,**
Ministry of Municipal Affairs and Housing Building Development Branch, 2012
and as updated from time to time.
(OBC)
- **Master Servicing Study for Cardinal Creek Village**
DSEL, July 2013
(MSS)
- **Cardinal Creek Village Functional Servicing and Stormwater Management Report**
DSEL, September 2013
(FSR)
- **Site Specific Water Budget Report - Cardinal Creek Village Development**
PECG, June 2013
- **Design Brief for Cardinal Creek Village Phase 4**
DSEL, September 2017
(Phase 4 Design Brief)
- **Transportation Noise Assessment – Cardinal Creek Village Phase 8**
Gradient Wind, July 9, 2026

- **Geotechnical Investigation – Proposed Residential Development – 1213 Old Montreal Road – Cardinal Creek Village Phase 4, Ottawa, Ontario**
Paterson Group, June 15, 2026
- **Cardinal Creek Village / Impact of Cardinal Creek Village Phase 8 Stormwater Management Design**
J.F. Sabourin and Associates Inc., July 9, 2026
(Stormwater Management Report)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

Phase 8 is located within the City of Ottawa's 1E Pressure Zone and is adjacent to existing municipal water infrastructure constructed as part of previous phases of the CCV development. The watermains in the vicinity of the subject lands are summarized in **Table 3.1**.

Table 3.1: Summary of Existing Watermains

Existing Watermain - Location	Type	Year Constructed	Pressure Zone
avenue de la Famille-Laporte Avenue	300 mm PVC	2017	1E
terrasse du Géographe Terrace	200 mm PVC	2017	1E

Per the *Phase 4 Design Brief*, the subject lands were previously proposed to be serviced via a 200mm diameter watermain stub connection from the existing 300 mm diameter watermain in Famille-Laporte Avenue. This watermain stub was constructed as part of CCV Phase 4, and is located in the northwest corner of the Phase 8 lands.

3.2 Water Supply Servicing Design

Potable water will be supplied to Phase 8 through pressurized watermains connecting to the existing CCV watermains in Famille-Laporte Avenue, and Géographe Terrace. The proposed watermain network can be seen in **Drawing 5**, and is summarized as follows:

- The majority of units in Phase 8 (Blocks 6-17) will be serviced by a proposed 200 mm diameter PVC watermain within the local road, which will connect to the existing 300 mm diameter PVC watermain within Famille-Laporte Avenue.
- The units fronting Famille-Laporte Avenue (Lot 1 & Blocks 2-5) and Géographe Terrace (Blocks 18-24) will connect directly to the existing 300 mm diameter PVC and 200 mm diameter PVC watermains, respectively.
- The existing 200mm diameter PVC watermain stub located at the north-west corner of the site will be removed during the construction of Phase 8.

The proposed watermain network was designed in accordance with the City of Ottawa *Water Supply Guidelines*, as summarized in

Table 3.2 below.

Table 3.2: Water Supply Design Criteria

Design Parameter	Value
Residential – Single Family	3.4 p/unit
Residential – Townhome/ Semi	2.7 p/unit
Residential Average Daily Demand	280 L/d/p
Residential – Maximum Daily Demand	2.5 x Average Daily Demand
Residential – Maximum Hourly Demand	2.2 x Maximum Daily Demand
Residential – Minimum Hourly Demand	0.5 x Average Daily Demand
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	275 kPa
During normal operating conditions pressure must not exceed	552 kPa
During fire flow operating pressure must not drop below	140 kPa
Notes: Extracted from Section 4: Ottawa Design Guidelines, Water Distribution (December 2025), Table 4.1 – Per Unit Populations, and Table 4.2 – Consumption Rates for Subdivisions of 501 to 3,000 Persons.	

A hydraulic analysis of the proposed water distribution system is documented in the *Hydraulic Capacity and Modeling Analysis – Cardinal Creek Village Phase 8 (GeoAdvice Report)* (GeoAdvice, July 13, 2026), included as **Appendix C**.

The required fire flow for the proposed development is capped at 167 L/s in accordance with the provisions of City of Ottawa Technical Bulletin ISTB-2018-02, as the proposed homes satisfy the required separation criteria. The *GeoAdvice Report* confirms that the proposed water distribution system provides a minimum available fire flow of 175 L/s, exceeding the required fire flow of 167 L/s. The analysis also confirms that the proposed system will maintain adequate pressures throughout the development under both normal operating and fire flow conditions. No pressure reducing valves are required to service the proposed development. See **Appendix C** for details.

3.3 Water Supply Conclusion

Potable water will be supplied to Phase 8 through connections to the existing CCV water distribution system within Famille-Laporte Avenue and Géographe Terrace, located within the City of Ottawa's 1E Pressure Zone.

The proposed watermain network, as shown in ***Drawing 5***, conforms to all relevant City and MECP *Water Supply Guidelines*. The hydraulic analysis of the proposed watermain network, completed within the *GeoAdvice Report*, concludes that all required domestic and fire flows can be met throughout the study area while maintaining acceptable operating pressures throughout development. See ***Appendix C*** for details.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

Phase 8 of Cardinal Creek Village is located adjacent to the existing sanitary sewer network within CCV Phase 4. The existing CCV sanitary sewer network ultimately conveys wastewater flows to the Trim Road Collector Sewer.

The surrounding existing sanitary sewer within the existing Phase 4 are summarized in **Table 4.1**, and the existing sewer network is shown on **Drawing 11**.

Table 4.1: Summary of Existing Sanitary Sewers

Existing Sanitary Sewer - Location	Type	Year Constructed
avenue de la Famille-Laporte Avenue	375 mm CONC	2017
terrasse du Géographe Terrace	200 mm PVC	2017

As part of the approved CCV Phase 4 design, a 200 mm diameter PVC sanitary sewer extension and associated manhole were provided from the existing 375 mm diameter sanitary sewer within Famille-Laporte Avenue to the northwest corner of the Phase 8 lands to service the previously proposed school block. Excerpts from the approved Phase 4 sanitary drainage plans and design sheets are provided in **Appendix D**.

4.2 Wastewater Design

The wastewater servicing plan for Phase 8 is to connect to the existing CCV Phase 4 sanitary infrastructure within Famille-Laporte Avenue and Géographe Terrace.

Phase 8 will be serviced by gravity sewers that are designed in accordance with the wastewater design parameters as summarized in

Table 4.2 below. The proposed sanitary sewer layout is depicted in **Drawing 11**, and is summarized as follows:

- The majority of units in Phase 8 (Blocks 6-17) will be serviced by a proposed 200 mm diameter PVC sanitary sewer within the local road, which will connect to the existing 375 mm diameter concrete sanitary sewer within Famille-Laporte Avenue.
- The units fronting Famille-Laporte Avenue (Lot 1 & Blocks 2-5) and Géographe Terrace (Blocks 18-24) will connect directly to the existing 375 mm diameter concrete and 200 mm diameter PVC sanitary sewers, respectively.

- The existing sanitary sewer stub and associated control manhole located at the northwest corner of the site, originally constructed to service the previously proposed school block, will be removed as part of the Phase 8 development.

Table 4.2: 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	$Q = \frac{1}{n} AR^{\frac{2}{3}} S^{\frac{1}{2}}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, Technical Bulletins, and recent residential subdivision in City of Ottawa.	

The proposed sanitary sewer network has been designed in accordance with all relevant City of Ottawa and MECP Guidelines. Further details can be found in the design sheets in **Appendix D**.

The ultimate downstream trunk sanitary sewer capacity was assessed using available sewer as-built information. The controlling downstream sewer segments were identified as the sanitary sewers between MH1002A and MH1004A, located west of the Cardinal Creek Village development adjacent to Trim Road and Regional Road 174. These sewers operate at approximately 70% of their available capacity under ultimate peak flow conditions, confirming that there is sufficient capacity in the downstream CCV sanitary network to accommodate the anticipated peak flows. The ultimate external sanitary drainage plan and design sheets are provided in **Appendix D**.

4.3 Wastewater Servicing Conclusion

A 200 mm diameter local gravity sewer is proposed within Phase 8 to convey flows to the existing sanitary sewer network in CCV Phase 4. Units fronting Famille-Laporte

Avenue and Géographe Terrace will connect directly to the existing 375 mm and 200 mm diameter sanitary sewers, respectively. The proposed wastewater servicing network is depicted in ***Drawing 11***.

The proposed wastewater servicing strategy is intended to convey wastewater into the existing phases of the CCV development before ultimately draining to the Trim Road Collector sewer. There is sufficient capacity in the downstream sanitary sewer network to accommodate the anticipated peak flows from CCV Phase 8. The sewers have been designed and will be constructed in conformance with all relevant City of Ottawa and MECP Guidelines and Policies. See ***Appendix D*** for details.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Drainage

Phase 8 is located within the Cardinal Creek subwatershed under the jurisdiction of the Rideau Valley Conservation Authority (RVCA). Existing storm sewer infrastructure in the surrounding area is shown in **Drawing 12**, and summarized in **Table 5.1**.

Table 5.1: Summary of Existing Storm Sewers

Existing Storm Sewer - Location	Type	Year Constructed
avenue de la Famille-Laporte Avenue	300 mm – 375 mm PVC, 525 mm – 675 mm CONC	2017
terrasse du Géographe Terrace	975 mm – 1200 mm CONC	2017

The surrounding existing phases of the CCV development, are serviced by the existing CCV Stormwater Management Pond 1 (SWM Pond 1), which is located north-east of the subject lands and south of Regional Road 174. The pond outflows ultimately discharge to the Ottawa River, crossing Highway 174 via an existing 2550 mm diameter culvert.

As part of the approved Phase 4 design, the subject lands were proposed to be serviced via a 450 mm diameter PVC storm sewer and associated manhole in the north-west corner of the property. Per the *Phase 4 Design Brief*, the subject lands were designed to capture on-site minor system flows up to the 5-year rational method event, with excess major system flows conveyed overland to Famille-Laporte Avenue. In the existing condition, the subject lands drain via a temporary cut-off swale along the western boundary of the site to a temporary DICB, connected to the stubbed sewer and manhole off Famille-Laporte Avenue. Excerpts of the approved Phase 4 drainage plans and design sheets are provided in **Appendix E**.

5.2 Stormwater Management Strategy

5.2.1 Minor System

CCV Phase 8 will be serviced by a combination of existing and new gravity sewers that are designed in accordance with City of Ottawa design criteria. The storm sewer layout is depicted in **Drawing 12**, and is summarized as follows:

- The proposed local road within CCV Phase 8 will be serviced by storm sewers ranging in diameter from 300 mm to 525 mm. The units fronting Famille-Laporte Avenue and Géographe Terrace will connect directly to the existing storm sewers within the adjacent roadway, as summarized in **Table 5.1**. To accommodate the proposed Phase 8 stormwater flows, a new stormwater manhole (MH404) will be constructed within Famille-Laporte Avenue between existing stormwater manhole (MH) 210 and MH 211. The existing 300 mm and 375 mm diameter storm sewers

between the new MH 404 and the existing MH 213 will be removed and replaced with a new 525 mm diameter storm sewer. The rest of the existing downstream storm sewer system, including MH 213, will remain unchanged.

- A system of rear-yard catchbasins and perforated storm pipes will service the proposed residential units. The rear-yard infrastructure connects to the street stormwater infrastructure via a solid 250 mm diameter pipe to the street.
- The storm sewer network directs flows toward the existing CCV Phase 4 storm sewer network which is serviced by the existing SWM Pond 1. SWM Pond 1 outflows are treated for quality and quantity control prior to discharge to the Ottawa River via the existing culvert under HWY174.

Table 5.12 summarizes the sewer design guidelines that have been employed in the design of the storm sewers. The storm sewer network is described in the detailed calculation sheets in **Appendix E**, with drainage areas provided in **Drawing 12**.

The runoff coefficients used in the rational method design sheets were based on the percentage of pervious area on-site. See the *Pervious Area Figure* (Figure 1) (DSEL, July 2026) in **Appendix E** for further details.

Table 5.1: Storm Sewer Design Criteria

Design Parameter	Value
Minor System Design Return Period	1:2 year (PIEDTB-2016-01) for local roads, without ponding 1:5 year (PIEDTB-2016-01) for collector roads, without ponding
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	$Q = \frac{1}{n} AR^{\frac{2}{3}} S^{\frac{1}{2}}$
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	2.0 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.8 m/s
Maximum Full Flowing Velocity	6.0 m/s
Clearance from 100-Year Hydraulic Grade Line to Building Opening	0.30 m
Max. Allowable Flow Depth on Municipal Roads	35 cm above gutter (PIEDTB-2016-01)
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 15cm vertical clearance is maintained between spill elevation on the street and the ground elevation at the nearest building envelope.
Stormwater Management Model	DDSWMM/XPSSWMM
Imperviousness	Based on percent Imperviousness (I) where Runoff Coefficient = (I/100) x 0.7 + 0.2
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, December 2025, Technical Bulletins, and based on recent residential subdivisions in City of Ottawa.	

The internal CCV Phase 8 minor system has been sized using a 2-year return frequency consistent with current City of Ottawa standards for local roads. The existing sewers within Famille-Laporte Avenue and Géographe Terrace have a 5-year level of service.

The storm sewer design uses inlet control devices (ICDs) to ensure that storm flows entering the minor system are limited to the 2-year return frequency. Note, there are locations where, in order to allow enough flow to be captured to maintain a water depth

of less than 35 cm during the 100-year storm event, the catchbasins will not have ICDs. See the *Cardinal Creek Village / Impact of Cardinal Creek Village Phase 8 Stormwater Management Design (Stormwater Management Report)* (JFSA, July 9, 2026) for details.

A peak rational method flow of 173 L/s from CCV Phase 8 is anticipated to outlet to the upsized Phase 4 storm sewer in Famille-Laporte Avenue. Rational method design sheets for the proposed internal Phase 8 storm sewer network are provided in **Appendix E**. The existing downstream storm sewer networks within Phase 1 and Phase 4 were also reviewed and updated to account for the anticipated Phase 8 flows. The modified Phase 1 and Phase 4 design sheets are provided in **Appendix E**. JFSA has confirmed that the entire downstream storm sewer network and SWM Pond 1 have sufficient capacity to accommodate the anticipated flows from CCV Phase 8. Refer to the *Cardinal Creek Village / Impact of Cardinal Creek Village Phase 8 Stormwater Management Design* (JFSA, July 9, 2026) provided under separate cover for details.

5.2.2 Hydraulic Grade Line

A detailed hydraulic grade line (HGL) analysis has been completed for the proposed storm sewer network as detailed in the *Cardinal Creek Village / Impact of Cardinal Creek Village Phase 8 Stormwater Management Design (Stormwater Management Report)* (JFSA, July 9, 2026) provided under separate cover.

The minor system HGL analysis was completed using the XPSWMM program, based on the peak flows captured during the rainfall events. The XPSWMM models were completed for the 2-year, 100-year 3-hour Chicago storm, 100-year 24-hour SCS Type II storm, the three historical events, and the 100-year 24-hour Chicago + 20% climate change stress test. A minimum freeboard of 0.3 m between the HGL and underside of footing (USF) elevations has been provided throughout Cardinal Creek Village, including Phase 8, for the 100-year design storms. A minimum freeboard of 0.0 m has been provided for all proposed CCV Phase 8 lots during the 100-year + 20% climate change stress test.

As portions of the existing Cardinal Creek Village system were approved prior to the City's current stress test freeboard standard being established, some existing areas do not maintain the 0.0 m freeboard requirement during the 100-year + 20% climate change stress test. See the *Stormwater Management Report* for additional details.

5.2.3 Major System

The local road grading of CCV Phase 8 will direct major system flow from the site towards the existing overland flow network within Famille-Laporte Avenue and the existing phases of CCV. Major system flow routing is illustrated in **Drawing 12**, and confirmation that the overland flow network in the existing Phases of CCV can accommodate the proposed Phase 8 overland flows can be found in the *Stormwater Management Report*.

A detailed model of static and dynamic ponding is provided in the *Stormwater Management Report*. It was determined that for the 100-year event, the total depth of water (static and dynamic) does not exceed 35 cm at any location, or reach the minimum opening elevation of an adjacent home.

Note, there are existing catchbasins within Famille-Laporte Avenue and Géographe Terrace that will need to be removed or relocated in order to accommodate the major system flows from Phase 8. See the *Stormwater Management Report* for details.

5.3 Grading and Drainage

The following additional grading criteria and guidelines have been applied to detailed design, per City of Ottawa *Sewer Design 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 on the drawings; and,
- Perforated pipe will be required for drainage swales if they are less than 1.5% in slope.
- Detailed grading design is presented in **Drawing 9**.

The proposed grading for Phase 8 does not exceed the 3 m permissible grade raise restriction as provided in the *Geotechnical Investigation* (Paterson Group, June 15, 2026).

5.4 Water Budget & Low Impact Development Measures

Phase 8 was included in the completed water budget assessment prepared for the entirety of the CCV development as detailed in the *Site Specific Water Budget Report - Cardinal Creek Village Development* (PECG, June 2013). The subject lands are located within the subcatchment area contributing to the Cardinal Creek North Tributary. As identified in the PECG report, while the North Tributary is primarily influenced by surface water runoff and agricultural drainage inputs under pre-development conditions, mitigation measures were recommended to offset impacts resulting from the CCV development.

To mitigate losses to the baseflow of the North Tributary, flows up to the 10mm storm event generated from a portion of CCV Phase 4 were designed to be directed to the

North Tributary. See **Appendix E** for details. These measures were reviewed and approved as part of CCV Phase 4 and are currently in operation, satisfying the recommendation from the *Site Specific Water Budget Report -Cardinal Creek Village Development* (PECG, June 2013). The PECG report does not require any additional measures beyond the implementation of standard rear-yard perforated pipes, consistent with the Phases 1-7 of CCV.

5.5 Stormwater Conveyance Conclusion

A network of local gravity sewers is proposed within Phase 8 to capture stormwater and convey the minor flows to the existing sewers within CCV Phase 4 on Famille-Laporte Avenue and Géographe Terrace. The storm sewers have been sized by the rational method, and inlet control devices are to be used to restrict the sewer capture rates. The storm sewer network is illustrated in **Drawing 12**. Rational method design sheets are provided in **Appendix E**.

The grading of CCV Phase 8 will direct major system flow from the site towards the overland flow network in the existing phases of CCV. All stormwater flows from Phase 8 will ultimately be treated by the existing CCV SWM Pond 1 for enhanced stormwater quality prior to discharge in the Ottawa River. See the *Cardinal Creek Village / Impact of Cardinal Creek Village Phase 8 Stormwater Management Design (Stormwater Management Report)* (JFSA, July 9, 2026) for details.

6.0 UTILITIES

Consultation with local utility service providers is ongoing. The preferred servicing strategies for hydro, telecommunications, streetlighting, and gas will be summarized on the composite utility plan and circulated for approval prior to construction.

Any existing utility infrastructure along the Famille-Laporte Avenue and Géographe Terrace frontages that conflicts with the proposed Phase 8 works will be relocated, as required. Any required relocations will be coordinated as part of the Phase 8 composite utility coordination process.

7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate, and topography. The extent of erosion losses is exaggerated where vegetation has been removed during construction and the top layer of soil becomes agitated.

Prior to earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction. See **Drawings 14 & 15** for additional details.

8.0 CONCLUSIONS AND RECOMMENDATIONS

This Servicing Brief has been prepared on behalf of Tamarack (Cardinal Creek) Corporation to detail the servicing plan for the Cardinal Creek Village Phase 8 Development within the City of Ottawa.

This Servicing Brief is to be read in conjunction with the Cardinal Creek Phase 8 detailed engineering drawing package, which consists of 15 drawings dated July 13, 2026.

A detailed hydraulic analysis of the proposed water distribution system is provided in the *Hydraulic Capacity and Modeling Analysis – Cardinal Creek Village Phase 8* (GeoAdvice, July 13, 2026), included in **Appendix C**. A detailed stormwater analysis is provided in the *Cardinal Creek Village / Impact of Cardinal Creek Village Phase 8 Stormwater Management Design* (J.F. Sabourin and Associates Inc., July 9, 2026), provided under separate cover.

The key features of the proposed servicing design are summarized as follows:

- Potable water will be supplied to the proposed development through connections to the existing municipal water distribution system within Famille-Laporte Avenue and Géographe Terrace.
- A network of local gravity sanitary sewers is proposed to convey wastewater flows to the existing sanitary sewer network within Cardinal Creek Village Phase 4, more specifically to the 375 mm and 200 mm diameter sanitary sewers within Famille-Laporte Avenue and Géographe Terrace. There is sufficient capacity in the downstream system to accommodate the Phase 8 wastewater flows.
- Minor stormwater flows from the proposed development will drain through a network of local gravity storm sewers to the existing storm sewer network within Cardinal Creek Village Phase 4. Major stormwater flows will be conveyed through the proposed overland flow network to the existing major drainage system within the surrounding phases of the development.
- Stormwater quality treatment and quantity control for the proposed development will be provided by the existing Cardinal Creek Village Stormwater Management Pond 1 prior to discharge to the Ottawa River. There is sufficient capacity in the downstream system to accommodate the Phase 8 stormwater flows.

The infrastructure identified in this Servicing Brief is expected to require approval from the City of Ottawa, Rideau Valley Conservation Authority, and the Ontario Ministry of the Environment, Conservation, and Parks prior to construction.

Servicing Brief
Cardinal Creek Village Phase 8
Tamarack (Cardinal Creek) Corporation
25-1480

Prepared by,
David Schaeffer Engineering Ltd.



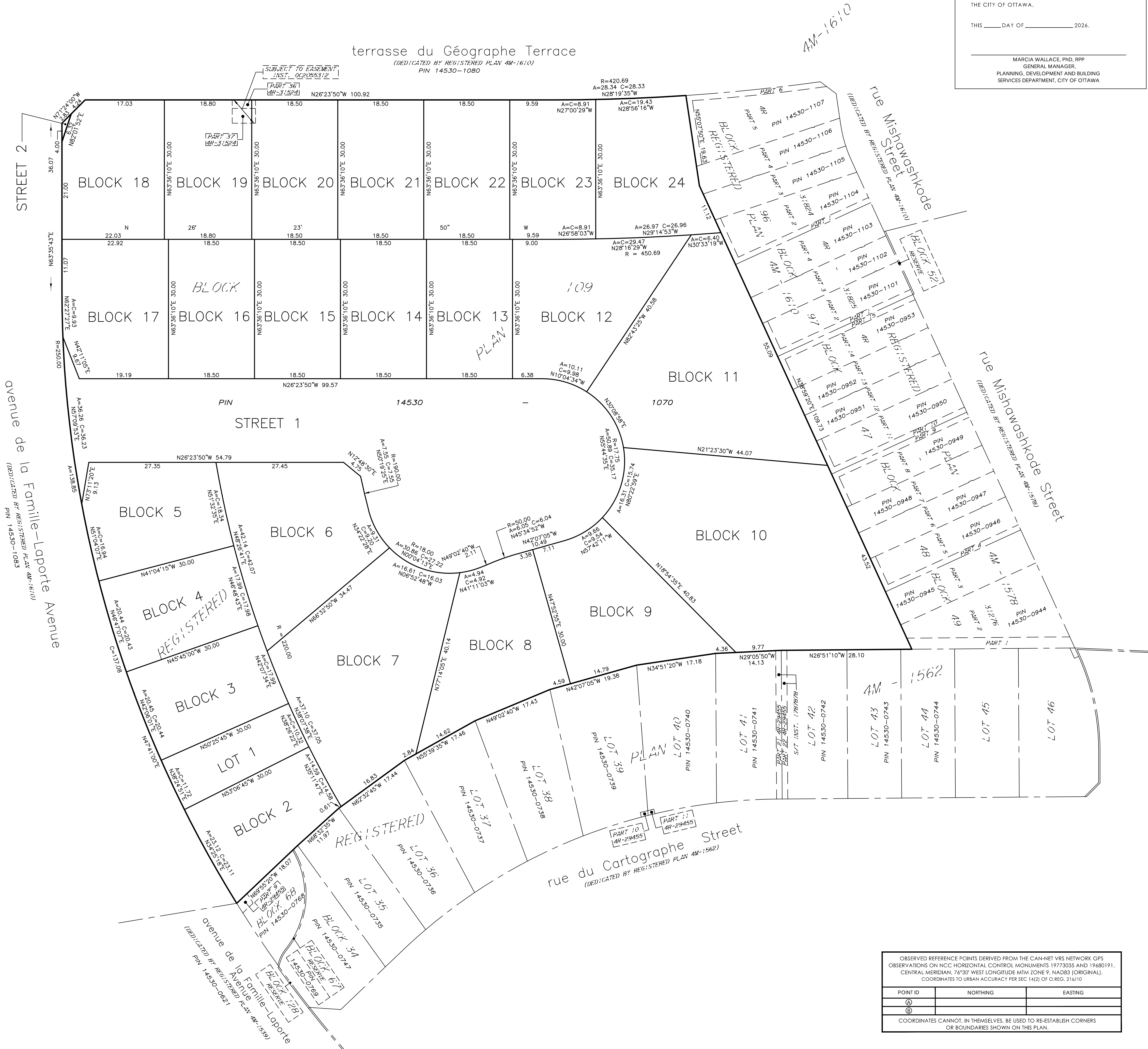
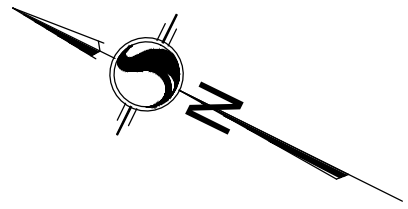
Per: Hannah Bulmer, P.Eng.

Per: Braden Kaminski, P.Eng.

© DSEL

Z:\Projects\25-1480_CCV Ph4 School Block\B_Design\B3_Reports\B3-2_Servicing (DSEL)\2026-07-07_1480_Ph8_Servicing Report

Appendix A



APPROVED UNDER SECTION 51 OF THE PLANNING ACT BY
THE CITY OF OTTAWA.

THIS ____ DAY OF _____ 2026.

MARCIA WALLACE, PHD, RPP
GENERAL MANAGER,
PLANNING, DEVELOPMENT AND BUILDING
SERVICES DEPARTMENT, CITY OF OTTAWA

PLAN 4M-

I CERTIFY THAT THIS PLAN IS REGISTERED IN THE LAND REGISTRY OFFICE
FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON (No.4)
AT ____ O'CLOCK ON THE ____ DAY OF _____, 2026
AND ENTERED IN THE REGISTER FOR PROPERTY IDENTIFIER 14530-1070
AND THE REQUIRED CONSENTS ARE REGISTERED AS PLAN DOCUMENT
NUMBER OC-____.

REPRESENTATIVE FOR LAND REGISTRAR

THIS PLAN COMPRISES ALL OF PIN 14530-1070.
PART OF BLOCKS 19 AND 20 ARE SUBJECT TO EASEMENT INST. OC2055312.

PLAN OF SUBDIVISION OF
BLOCK 109
REGISTERED PLAN 4M-1610
CITY OF OTTAWA



METRIC CONVERSION
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES
AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

GRID SCALE CONVERSION
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE
COMBINED SCALE FACTOR OF 0.999978.

BEARING NOTE
BEARINGS ARE GRID, DERIVED FROM THE CAN-NET VRS NETWORK OBSERVATIONS
ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191, CENTRAL
MERIDIAN, 76°30' WEST LONGITUDE MTM ZONE 9, NAD83 (ORIGINAL).

19773035 N:5006040.42 E:324888.04
19680191 N:5033564.26 E:388064.94

LEGEND		
	DENOTES	FOUND MONUMENTS(STANTEC)
■		SET MONUMENTS (IB)
IB	•	IRON BAR
IBB	•	ROUND IRON BAR
SIB	•	STANDARD IRON BAR
SSIB	•	SHORT STANDARD IRON BAR
CC	•	CUT CROSS
CP	•	CONCRETE PIN
WIT	•	WITNESS
PIN	•	PROPERTY IDENTIFICATION NUMBER
M/MEAS	•	MEASURED
SET	•	SET
OU	•	ORIGIN UNKNOWN
SG	•	STANTEC GEOMATICS LTD.
P	•	REGISTERED PLAN 4M-1610
ORP	•	OBSERVED REFERENCE POINT

OWNER'S CERTIFICATE
THIS IS TO CERTIFY THAT :
1. LOT 1, BLOCKS 2 TO 24, BOTH INCLUSIVE, THE STREETS, NAMELY *, HAVE BEEN LAID
OUT IN ACCORDANCE WITH OUR INSTRUCTIONS.
2. THE STREETS AND STREET WIDENINGS AND LANES ARE DEDICATED TO CITY OF
OTTAWA AS PUBLIC HIGHWAYS.

DATE

*PRESIDENT
ONTARIO LIMITED
I HAVE THE AUTHORITY TO BIND THE CORPORATION

SURVEYOR'S CERTIFICATE
I CERTIFY THAT :
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS
ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE
UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE ____ DAY OF _____, 2026.

DATE

FRANCIS LAU
ONTARIO LAND SURVEYOR

THIS PLAN OF SURVEY RELATES TO AOLS PLAN SUBMISSION FORM NUMBER #####.

Stantec Geomatics Ltd.
CANADA LANDS SURVEYORS
ONTARIO LAND SURVEYORS
1331 GLYDE AVENUE, SUITE 300
OTTAWA, ONTARIO, K2C 3G4
TEL. 613.722.4420
stantec.com

OBSERVED REFERENCE POINTS DERIVED FROM THE CAN-NET VRS NETWORK GPS OBSERVATIONS ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191, CENTRAL MERIDIAN, 76°30' WEST LONGITUDE MTM ZONE 9, NAD83 (ORIGINAL). COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O. REG. 216/10		
POINT ID	NORTHING	EASTING
①		
②		
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.		

DRAWN: ME CHECKED: * PM: FL FIELD: * PROJECT No.: 161614995-132

Appendix B



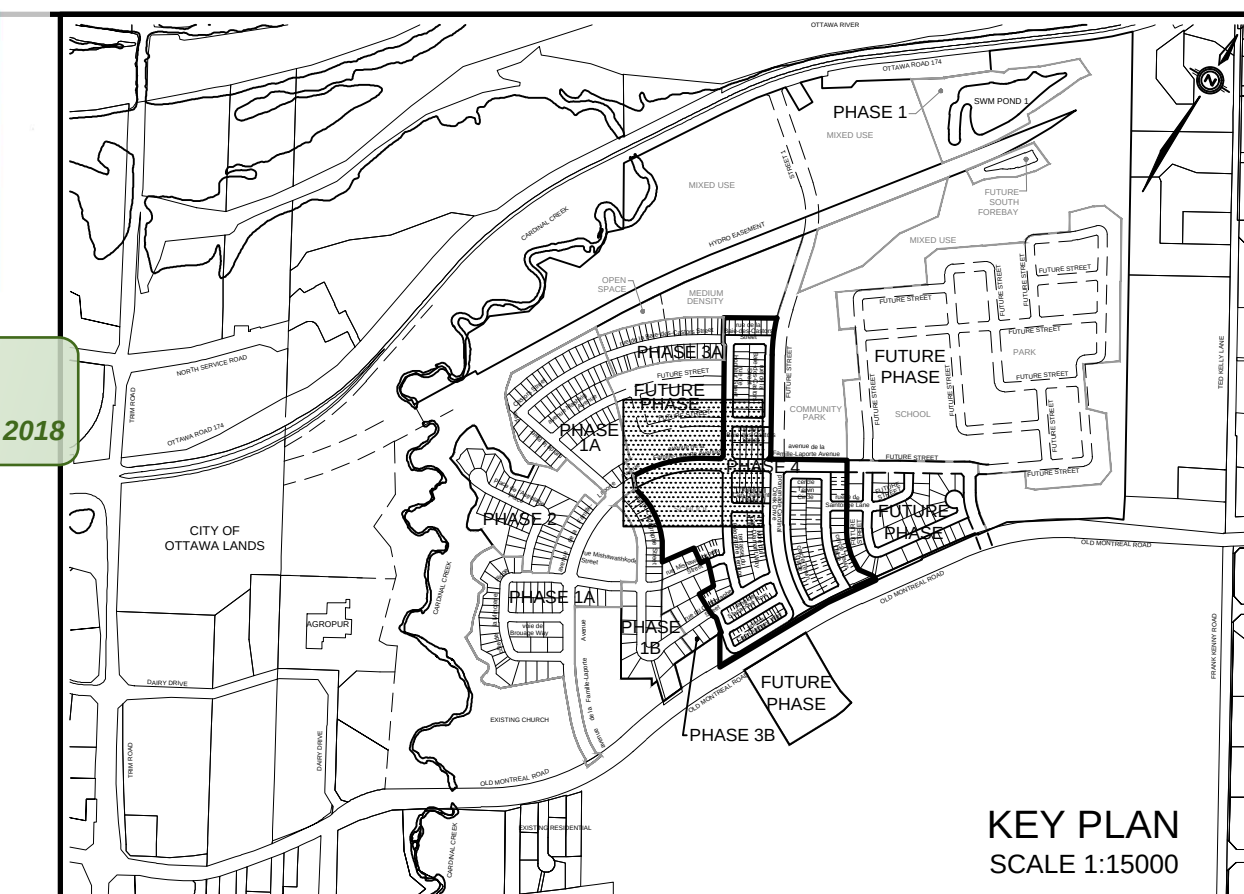
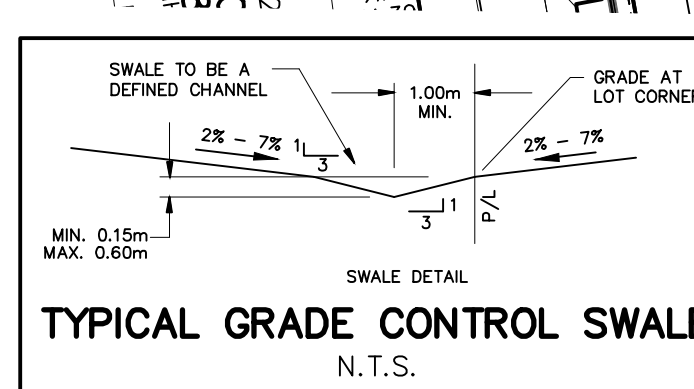
FOR DEEP SERVICE CONNECTIONS PROVIDED FOR LOT
4-8 FRONTING rue de la Baie-des-Castors Street,
LOTS 27-28 FRONTING rue de Honfleur Street,
BLOCKS 80-81 FRONTING cercle Tewin Circle, BLOCK
90, 99-100 FRONTING terrasse du Géographe Terrace
AND BLOCK 102 FRONTING rue du Cartographe Street
REFER TO THE DETAIL ON DWG. 4

NOTE:
FOR CROSS-SECTION 9-9
REFER TO DWG No. 36.

NOTE:
THE COVER OF EX. MH,
CB, CHAMBER AND OTHER
ABOVEGROUND FEATURES
TO BE ADJUSTED TO SUIT
THE NEW FINISHED GRADE,
WHERE APPLICABLE

NOTE RE: LOTS 1-8 & EXISTING
LAPORTE LANDS - SLOPE
REINSTATEMENT
FOR GEOTECHNICAL RECOMMENDATIONS
ON TREATMENT FOR FILL SLOPES
STEEPER THAN 3H:1V AND SHALLOWER
OR EQUAL TO 2H:1V REFER TO MEMO
PG1796-MEMO.129 DATED AUGUST 31,
2017, PREPARED BY PATERSON
GROUP, FOR DETAIL

REFER TO
DWG No.29



OVERLAND FLOW DIRECTION →

EXTERNAL OVERLAND FLOW DIRECTION →

REAR YARD OVERLAND FLOW DIRECTION →

RETAINING WALL AND ELEVATIONS

NOISE BARRIER (3.2m UNLESS OTHERWISE NOTED)

1.5m CHAIN LINK FENCE

CONSTRUCTION FENCE

1.8m WOOD SCREEN FENCE

PROPERTY BOUNDARY

3:1 TERRACING MAXIMUM SLOPE

PONDING AREA WITH SPILLWAY ELEVATION (MAXIMUM 0.35m)

250ø PVC PERFORATED PIPE (REFER TO CITY STD S29 FOR REAR YARD TRENCH AND PIPE DETAILS ONLY) (SUBDRAIN APPLIED FOR SLOPE LESS THAN 1.5%)

TACTILE WALKING SURFACE INDICATOR (AS PER CITY OF OTTAWA STD. SC6, SC7, SC7.1, SC7.2, SC7.3)

T/W=10.5
B/W=102
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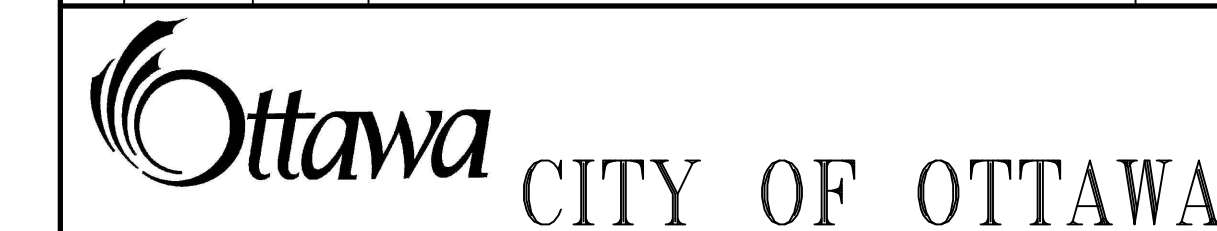
REFER TO
DWG No.31

TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC GEOMATICS LTD, PROJECT No. 161611900-111
RECEIVED ON JULY 6, 2012 AND PROJECT No. 16162924-111 RECEIVED ON OCTOBER 24, 2013
AND NOVEMBER 29, 2013 AND PROJECT No. 161613473-111 RECEIVED ON MAY 10, 2016

CALCULATED M-PLAN PROVIDED BY STANTEC GEOMATICS LTD, PROJECT No. 161613653-132
RECEIVED ON JUNE 14, 2017. R-PLAN PROVIDED BY STANTEC GEOMATICS LTD., PROJECT No.
161613473-114 DATED JUNE 15, 2016

ELEVATIONS HEREON ARE GEODETIC AND ARE DERIVED FROM THE CAN-NET VRS NETWORK

5.	18-05-15	W.L.	FOR GRADING APPROVAL	
4.	18-03-12	W.L.	LOTS 12-18 AND BLOCK 68 REVISIONS	
3.	17-11-01	W.L.	3rd SUBMISSION	
2.	17-09-12	W.L.	2nd SUBMISSION	
1.	17-07-24	W.L.	1st SUBMISSION	
No.	DATE	BY	DESCRIPTION	BY



PROJECT No. 16-864 B1

© DSEL

CARDINAL CREEK VILLAGE
PHASE 4

DSEL
david schaeffer engineering ltd

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEI.ca

DRAWN BY:

P.P/J.X	CHE
---------	-----

DRAWING NO.

SHEET NO.

30

22

CITY FILE No. D07-16-13-0024PH4 CITY PLAN No. _____

AMENDED ENVIRONMENTAL COMPLIANCE APPROVALNUMBER 7792-ASJR4M
Issue Date: October 31, 2017

Tamarack (Cardinal Creek) Corporation
3187 Albion Road South
Ottawa, Ontario
K1V 8Y3

Site Location: Cardinal Creek Village - Phase 4
1123-1291 Old Montreal Road
Part of Lots 25, 26, 27 and 28, Concession 1 (Old Survey)
City of Ottawa, Ontario

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

an amendment to the wastewater infrastructure Works servicing Phase 1 of the Cardinal Creek Village residential development forming part of an approximately 121 parcel of land located east of Cardinal Creek, north of Old Montreal Road in the City of Ottawa, to reflect the as-built condition and increase the drainage area discharging to the existing Pond 1 to accommodate stormwater run-off from an additional approximately 55.26 hectares, providing Enhanced Level water quality control and erosion protection for all storm events up to and including the 100-year storm event, and the establishment of wastewater infrastructure Works for Cardinal Creek Village Phase 4, located on parts of Lots 26 and 27, Concession 1 (Old Survey) in Ottawa, Ontario, with an area of approximately 14 ha for the collection and transmission of sanitary out flow, collection, transmission, Enhanced Level treatment, and disposal of stormwater run-off, erosion protection, and storm sewer surcharge protection (using inlet control devices) for all storm events up to and including the 100-year storm event consisting of the following:

Proposed Works:

Sanitary Sewers servicing Phase 4 of Cardinal Creek Village, discharging to existing sewers in previous Cardinal Creek Village phases as follows:

- **Famillie-Laporte Avenue** from PH 4 Boundary (STA. 1+050.11) to PH4 Boundary (STA. 0+630.56);

- **Baie-des-Castors Street** from 15m east of Future Street (STA. 0+014.82) to 30m east of Honfleur Street (STA. 0+283.14));
- **Cardinal Creek Drive** from 28.5m east of PH4 Boundary (STA. 1+129.52) to Famille-Laporte Avenue (STA. 0+786.84);
- **Tewin Circle** from 156m south of Saintonge Lane (STA. 0+235.40) to Famille-Laporte Avenue (STA. 0+000.00);
- **Cap-Diamant Way (north)** from 78.5m east of Géographe Terrace (STA. 0+082.96) to Géographe Terrace (STA. 0+000.00);
- **Cap-Diamant Way (south)** from 51.5m south of Stadaconé Row (STA. 0+305.98) to Cartographe Street (STA. 0+517.81);
- **Cartographe Street** from Cap-Diamant Way (STA. 0+293.748) to Cap-Diamant Way (STA. 0+0+410.81);
- **Mishawashkode Street** from PH 4 Boundary (STA. 0+277.79) to Géographe Terrace (STA. 0+328.66);
- **Stadaconé Row** from 13m south of Cap-Diamant Way (STA. 0+121.52) to Cap-Diamant Way (STA. 0+000.00);
- **Géographe Terrace** from Cartographe Street (STA. 0+261.37) to Honfleur Street (STA. 0+000.00);
- **Honfleur Street** from 16m north of Future Street (STA. 0+148.14) to Baie-des-Castors Street (STA. 0+017.09); and,
- **Towards Future Phase** from 8m east of Baie-des-castors Street (STA. 0+008.00) to Baie-des-Castors Street (STA. 0+000.00).

Storm Sewers servicing Phase 4 of Cardinal Creek Village, discharging partly to existing sewers in previous Cardinal Creek Village phases, partly to Oil and Grit Separator, and partly to Temporary Storm Outfall Channel, as follows:

- **Famille-Laporte Avenue** from PH 4 Boundary (STA. 0+626.68 to STA. 0+798.76) to PH 4 Boundary (STA. 0+810.36 to STA. 1+050.11);
- **Baie-des-Castors Street (north)** from 89.5m east of Future Street (STA. 0+089.49 to STA. 0+226.58) to 30m east of Honfleur Street (STA. 0+235.03 to STA. 0+283.19);
- **Baie-des-Castors Street (south)** from Street 76.5m east of Honfleur Street (STA. 0+076.57) to Honfleur Street (STA. 0+000.00);

- **Cardinal Creek Drive** from 28.5m east of PH4 Boundary (STA. 1+130.25) to 22.5m north of Famille-Laporte Avenue (STA. 0+764.11);
- **Tewin Circle** from 157.5m south of Saintonge Lane (STA. 0+236.42) to Famille-Laporte Avenue (STA. 0+002.50);
- **Cap-Diamant Way (north)** from 81.5m east of Géographe Terrace (STA. 0+081.45) to Géographe Terrace (STA. -0+002.39);
- **Cap-Diamant Way (south)** from 52m south of Stadaconé Row (STA. 0+307.11) to Cartographe Street (STA. 0+515.79);
- **Cartographe Street** from Cap-Diamant Way (STA. 0+293.75) to Géographe Terrace (STA. 0+409.74);
- **Mishawashkode Street** from PH 4 Boundary (STA. 0+277.79) to Géographe Terrace (STA. 0+325.63);
- **Stadaconé Row** from 13m south of Cap-Diamant Way (STA. 0+123.10) to Block 108 (STA. -0+009.87);
- **Géographe Terrace** from Cartographe Street (STA. 0+263.66) to Honfleur Street (STA. 0+002.50);
- **Honfleur Street** from Famille-Laporte Avenue (STA. 0+251.62) to Baie-des-Castors Street (STA. 0+017.08); and,
- **Temporary Storm Outfall** from Baie-des-Castors Street (STA. 0+001.35) to Temporary Storm Outfall Channel (STA. 0+019.03).

Storm Outfall Channel approximately 461 m of a temporary storm outfall channel located to the north of Cardinal Creek Drive, receiving flow from the 1950mm concrete storm sewer at the north end of Cardinal Creek Drive, discharging via existing temporary storm outfall channel to Pond 1.

Grassed Swales servicing Phase 4 of Cardinal Creek Village, as follows:

- **Future Phase - South of Old Montreal Road** – Approximately 158 m of a temporary cut-off swale discharging to the storm sewer network mentioned above via MH 2000 south of Old Montreal Road;
- **Future Phase** – East of Phase 4 – Approximately 246 m of a temporary cut-off swale discharging to the Temporary Storm Outfall Channel mentioned above via an existing ditch north of Famille-Laporte Avenue; and,
- **Pond 1 Bypass** – east of Pond 1 – Approximately 145 m of a temporary cut-off swale discharging to the existing roadside ditch south of Ottawa Road 174 to maintain existing drainage patterns.

Oil and Grit Separator (the 10 mm storm flows for a catchment area of 4.01 ha): One (1) Hydroguard HG 10

oil/grit separator (OGS), or Equivalent, designed for Enhanced Level of protection, having a sediment storage capacity of 4.59 m³, a maximum treatment rate of 252 L/s, receiving inflow from the storm sewer located north of the intersection of Honfleur Street and Famille-Laporte Avenue, discharging to the North Tributary of Cardinal Creek via a 450mm diameter outlet pipe and modifications to the existing North Tributary of Cardinal Creek.

Modifications to Existing Stormwater Management Facility (Pond 1 – catchment area 145.23 ha): - an increase in the drainage area to the existing Pond 1, having one (1) wet pond with a sediment forebay, located on Block 626, north of an existing hydro corridor, west of Ted Kelly Lane, having a permanent pool volume of 20,770 m³, an extended detention volume of 5,851 m³, and a total storage volume of approximately 57,471 m³, including the permanent pool volume, at a total depth of approximately 4.55 m, receiving flow from the temporary storm outfall channel and 2550 mm diameter and 3000 mm diameter storm sewer to the sediment forebay, and 1350 mm diameter bypass storm sewer to the main cell, and discharging via a concrete outlet structure, a 2250 mm diameter outlet pipe and spillway to an existing 2550 mm concrete culvert under Ottawa Road 174 to the Ottawa River. No physical changes to Pond 1 under Proposed Works.

Previous Works

trunk storm sewer: - a 2400 mm diameter storm sewer on the Service Easement (Block 147) from Block 146 (Drawing Number 152) (MH127), across the existing hydro corridor, to Service Easement (Drawing Number 153A), discharging to a temporary storm outfall channel, identified below;

temporary storm outfall channel: - approximately 776 m of a temporary storm outfall channel located in a Service Easement along the north side of an existing hydro corridor, receiving flow from the 2400 mm diameter trunk storm sewer, identified above, discharging via a 2550 mm diameter and 3000 mm diameter storm sewer, and 1350 mm diameter bypass storm sewer, to the stormwater management facility, identified below;

stormwater management facility (Pond 1 - catchment area 89.97 hectares): - one (1) wet pond with a sediment forebay, located on Block 626, north of an existing hydro corridor, west of Ted Kelly Lane, having a permanent pool volume of 20,341 m³, an extended detention volume of 5,730 m³, and a total storage volume of approximately 56,286 m³, including the permanent pool volume, at a total depth of approximately 4.55 m, receiving flow from the temporary storm outfall channel and 2550 mm diameter and 3000 mm diameter storm sewer to the sediment forebay, and 1350 mm diameter bypass storm sewer to the main cell, identified above, and discharging via a concrete outlet structure, a 2250 mm diameter outlet pipe and spillway, and an existing 1.5 m by 1.15 m box culvert and 2100 diameter culvert under Ottawa Road 174 to the Ottawa River;

storm sewers servicing Phase 1 of Cardinal Creek Village, as follows:

- **avenue de la Famille-Laporte Avenue** from Old Montreal Road (Sta. 0+001.62) to avenue de la Famille-Laporte Avenue (Temp. dead end) (Sta. 0+630.56);
- **côte de la Minoterie Ridge** from avenue de la Famille-Laporte Avenue (Sta. 0+015.76) to avenue de la Famille-Laporte Avenue (Sta. 0+381.44);
- **Service Easement Part 1, 2 & 3** from côte de la Minoterie Ridge (Sta. 0+009.63) to rue de la

Baie-des-Castors Street (Sta. 0+129.93);

- **rue Mishawashkode Street** from avenue de la Famille-Laporte Avenue (Sta. 0+001.40) to rue Mishawashkode Street (MH120) (Sta. 0+098.71);
- **rue Mishawashkode Street** from rue de Cartographe Street (Sta. 0+141.34) to rue Mishawashkode Street (Temp. dead end) (Sta. 0+175.42);
- **voie de Brouage Way** from côte de la Minoterie Ridge (Sta. -0+002.44) to voie de Brouage Way (Sta. 0+113.945);
- **rue de Cartographe Street** from avenue de la Famille-Laporte Avenue (Sta. 0+001.47) to rue Mishawashkode Street (Sta. 0+194.29);
- **rue de Cartographe Street** from rue Mishawashkode Street (Sta. -0+002.07) to rue de Cartographe Street (Temp. dead end) (Sta. 0+221.43);
- **rue de la Baie-des-Castors Street** from avenue de la Famille-Laporte Avenue (Sta. -0+001.31) to rue de la Baie-des-Castors Street (Temp. dead end) (Sta. 0+463.916);
- **avenue Mashkig Avenue** from rue de la Baie-des-Castors Street (Sta. -0+002.76) to avenue Mashkig Avenue (MH 1410) (Sta. 0+152.39);
- **Block 146** from rue de la Baie-des-Castors Street (Sta. 0+013.12) to Service Easement (Sta. 0+045.63);

sanitary sewers servicing Phase 1 of Cardinal Creek Village, as follows:

- **avenue de la Famille-Laporte Avenue** from Old Montreal Road (Sta. -0+005.820) to avenue de la Famille-Laporte Avenue (Temp. dead end) (Sta. 0+630.560);
- **côte de la Minoterie Ridge** from avenue de la Famille-Laporte Avenue (Sta. 0+013.390) to avenue de la Famille-Laporte Avenue (Sta. 0+392.220);
- **Service Easement Part 1, 2 & 3** from côte de la Minoterie Ridge (Sta. 0+000.000) to rue de la Baie-des-Castors Street (Sta. 0+132.450);
- **rue Mishawashkode Street** from avenue de la Famille-Laporte Avenue (Sta. 0+001.230) to rue Mishawashkode Street (MH120A) (Sta. 0+100.660);
- **rue Mishawashkode Street** from rue de Cartographe Street (Sta. 0+143.360) to rue Mishawashkode Street (Temp. dead end) (Sta. 0+173.930);

- **voie de Brouage Way** from côte de la Minoterie Ridge (Sta. -0+000.370) to avenue de la Famille-Laporte Avenue (Sta. 0+129.610);
- **rue de Cartographe Street** from avenue de la Famille-Laporte Avenue (Sta. -0+000.250) to rue Mishawashkode Street (Sta. 0+196.240);
- **rue de Cartographe Street** from rue Mishawashkode Street (Sta. 0+000) to rue de Cartographe Street (Temp. dead end) (Sta. 0+221.430);
- **rue de la Baie-des-Castors Street** from avenue de la Famille-Laporte Avenue (Sta. 0+000.250) to rue de la Baie-des-Castors Street (Temp. dead end) (Sta. 0+461.980);
- **rue de la Baie-des-Castors Street** (High Level Sewer) from rue de la Baie-des-Castors Street (Sta. 0+113.370) to rue de la Baie-des-Castors Street (Sta. 0+236.260);
- **avenue Mashkig Avenue** from rue de la Baie-des-Castors Street (Sta. 0+000) to avenue Mashkig Avenue (MH 1420A) (Sta. 0+152.480);
- **Block 146** from rue de la Baie-des-Castors Street (Sta. 0+003.820) to Service Easement (Sta. 0+054.542);
- **Service Easement** from Block 146 (Drawing 157) (Sta. 0+002.650) to Service Easement (Sta. 0+041.710);
- **Service Easement** from Service Easement (MH1015A) (Sta. 0+259.350) to Service Easement (Drawing 152) MH10160A – (Sta. 0+093.680);
- **Service Easement** from Trim Road (50 m south of Regional Road 174) (MH1103A) (Sta. 0+188.20) to Service Easement (MH10160A) (Sta. 1+053.100);
- **Service Easement (parallel to west side of Trim Road)** from Sanitary Outlet approximately 160 m south of Regional Road 174 (SAMH1100A) (Sta. 0+010.00) to Service Easement (east side of Trim Road) 50 m south of Regional Road 174 (MH1103A) (Sta. 0+188.20);

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the submitted supporting documents listed in Schedule "A" forming part of this Approval.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval " means this entire document and any schedules attached to it, and the application;

2. "*Director* " means a person appointed by the Minister pursuant to section 5 of the *EPA* for the purposes of Part II.1 of the *EPA* ;
3. "*District Manager* " means the District Manager of the appropriate local District Office of the *Ministry* , where the *Works* are geographically located;
4. "*EPA* " means the *Environmental Protection Act*, R.S.O. 1990, c.E.19, as amended;
5. "*Equivalent* " means a substituted oil and grit separator that meets the required quality and performance standards of the approved oil and grit separator;
6. "*Ministry* " means the ministry of the government of Ontario responsible for the *EPA* and *OWRA* and includes all officials, employees or other persons acting on its behalf;
7. "*Owner* " means Tamarack (Cardinal Creek) Corporation, and includes its successors and assignees;
8. "*OWRA* " means the *Ontario Water Resources Act*, R.S.O. 1990, c. O.40 , as amended;
9. "*Professional Engineer* " means a person entitled to practice as a Professional Engineer in the Province of Ontario under a licence issued under the *Professional Engineers Act* ;
10. "*Wet Event* " means a rainfall event with a minimum of 15 millimetres of rain in a 24 hour period;
11. "*Previous Works* " means those portions of the sewage Works previously approved under an Approval;
12. "*Proposed Works* " means the sewage works described in the Owner's application, this Approval, to the extent approved by this Approval;
13. "*Works* " means the sewage Works described in the Owner's application, and this Approval, and includes Proposed Works and Previous Works.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL CONDITIONS

1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2. Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.
3. Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.
4. Where there is a conflict between the documents listed in Schedule A and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.
5. The conditions of this Approval are severable. If any condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

2. EXPIRY OF APPROVAL

1. This Approval will cease to apply to those parts of the Work which have not been constructed within five (5) years of the date of this Approval.
2. In the event that completion and commissioning of any portion of the Works is anticipated to be delayed beyond the specified expiry period, the Owner shall submit an application of extension to the expiry period, at least twelve (12) months prior to the end of the period. The application for extension shall include the reason(s) for the delay, whether there is any design change(s) and a review of whether the standards applicable at the time of Approval of the Works are still applicable at the time of request for extension, to ensure the ongoing protection of the environment.

3. CHANGE OF OWNER

1. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:
 - a. change of Owner;
 - b. change of address of the Owner;
 - c. change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the District Manager; or

- d. change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the District Manager.
2. In the event of any change in ownership of the Works, other than a change to a successor municipality, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the District Manager and the Director.
3. The Owner shall ensure that all communications made pursuant to this condition refer to the number at the top of this Approval.
4. Notwithstanding any other requirements in this Approval, upon transfer of the ownership or assumption of the Works to a municipality if applicable, any reference to the District Manager shall be replaced with the Water Supervisor.

4. OPERATION AND MAINTENANCE

1. If applicable, any proposed storm sewers or other stormwater conveyance in this Approval can be constructed but not operated until the proposed stormwater management facilities in this Approval or any other Approval that are designed to service the storm sewers or other stormwater conveyance are in operation.
2. The Owner shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the Works do not constitute a safety or health hazard to the general public.
3. The Owner shall inspect and ensure that the design minimum liquid retention volume is maintained in the Works at all time, except when maintenance is required.
4. The Owner shall undertake an inspection of the condition of the Works, at least once a year, and undertake any necessary cleaning and maintenance to ensure that sediment, debris and excessive decaying vegetation are removed from the Works to prevent the excessive build-up of sediment, oil/grit, debris and/or decaying vegetation, to avoid reduction of the capacity and/or permeability of the Works, as applicable. The Owner shall also regularly inspect and clean out the inlet to and outlet from the Works to ensure that these are not obstructed.
5. The Owner shall design, construct and operate the Works with the objective that the effluent from the Works is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film, sheen, foam or discoloration on the receiving waters.
6. The Owner shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the Owner's administration office for inspection by the Ministry. The logbook shall include the following:

- a. the name of the Works; and

- b. the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed and method of clean-out of the Works.
- 7. The Owner shall prepare an operations manual prior to the commencement of operation of the Works that includes, but is not necessarily limited to, the following information:
 - a. operating and maintenance procedures for routine operation of the Works;
 - b. inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;
 - c. repair and maintenance programs, including the frequency of repair and maintenance for the Works;
 - d. contingency plans and procedures for dealing with potential spills and any other abnormal situations and for notifying the District Manager; and
 - e. procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.
- 8. The Owner shall maintain the operations manual current and retain a copy at the location of the Works for the operational life of the Works. Upon request, the Owner shall make the manual available to Ministry staff.

5. TEMPORARY EROSION AND SEDIMENT CONTROL

- 1. The Owner shall install and maintain temporary sediment and erosion control measures during construction and conduct inspections once every two (2) weeks and after each significant storm event (a significant storm event is defined as a minimum of 25 mm of rain in any 24 hours period). The inspections and maintenance of the temporary sediment and erosion control measures shall continue until they are no longer required and at which time they shall be removed and all disturbed areas reinstated properly.
- 2. The Owner shall maintain records of inspections and maintenance which shall be made available for inspection by the Ministry, upon request. The record shall include the name of the inspector, date of inspection, and the remedial measures, if any, undertaken to maintain the temporary sediment and erosion control measures.

6. MONITORING AND RECORDING

The Owner shall, upon commencement of operation of the Works, carry out the following monitoring program:

1. During excavation of the natural terrain in relation to the establishment of the Works, the Owner shall retain the services of a person duly appointed by a professional engineer, qualified to practice geotechnical engineering and who shall, on behalf of the said geotechnical engineering practitioner:
 - a. observe the presence or absence of groundwater in all excavations, opened for any duration, on any and all given days;
 - b. observe whether groundwater flow is artesian in nature or not, when the groundwater is assessed in the context of Subsection (1) (a), above;
 - c. measure the elevation at which groundwater is observed, when applicable, on a daily basis, and take note of the pumping rate – (no pumping corresponds to a rate of 0 (zero) litres per day) – at approximately the same time as the groundwater elevation is measured; and
 - d. record in a log book the location of each and every excavation at which the findings from Subsections (1) (a), (b) and (c), above, are made along with the corresponding dates.
2. Upon request, the Owner shall make available for review and/or copying by Ministry personnel the logbook in which groundwater monitoring observations and data have been recorded.
3. All samples and measurements taken for the purposes of this Approval are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.
4. Samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded, **as seen in Schedule B.**
5. The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:
 - a. the Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only)", as amended from time to time by more recently published editions;
 - a. the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions; and
 - b. the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions.

7. TEMPORARY RESTRICTION ON THE OPERATION OF THE WORKS

1. All sewage works shall be capped and/or kept disconnected from any and all drainage pathways,

to prevent the collection and conveyance of stormwater, snowmelt and/or drainage waters, until such time as the stormwater management facility Pond 1 is ready to treat and dispose of the same, in accordance with this Approval.

8. REPORTING

1. One (1) week prior to the start-up of the operation of the Works, the Owner shall notify the District Manager(in writing) of the pending start-up date.
2. The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.
3. The Owner shall prepare and submit a performance report to the District Manager on an annual basis, within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the commencement of operation of the Works and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:
 - a. a summary and interpretation of all monitoring data and an overview of the success and adequacy of the Works, including demonstration using the monitoring data that the appropriate level of quality control has been achieved;
 - b. a description of any operating problems encountered and corrective actions taken;
 - c. a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works, including an estimate of the quantity of any materials removed from the Works;
 - d. a summary of the calibration and maintenance carried out on all monitoring equipment;
 - e. a summary of any complaints received during the reporting period and any steps taken to address the complaints;
 - f. a summary of all spill or abnormal discharge events; and
 - g. any other information the District Manager requires from time to time.

9. SOURCE WATER PROTECTION

1. The Owner shall ensure, if applicable, that the design, construction and operation of the Works conforms to any Significant Threat Policies in any Source Protection Plan that applies to the location of the Works.

Schedule 'A' forms part of this *Approval* and contains a list of supporting documentation / information received, reviewed and relied upon in the issuance of this *Approval* .

SCHEDULE "A"

1. Application for Environmental Compliance Approval for Municipal and Private Sewage Works, dated September 15, 2017 and received on October 12, 2017, submitted by Tamarack (Cardinal Creek) Corporation.
2. Transfer of Review Letter of Recommendation, dated October 5, 2017, and signed by Charles Warnock, P. Eng., City of Ottawa.
3. Application for Environmental Compliance Approval for Sanitary and Storm Sewers, dated April 22, 2014 and received on June 6, 2014, including final plans, specifications and documents prepared by David Schaeffer Engineering Ltd.;
4. Application for Environmental Compliance Approval for Trunk Storm Sewer, Temporary Outfall Ditch and Stormwater Management Pond, dated April 22, 2014 and June 6, 2014, submitted by David Schaeffer Engineering Ltd. through the City of Ottawa;
5. Design Brief for Interim Stormwater Management Pond 1 for Phase 1, 2 and 3 in Cardinal Creek Village, dated May 2014, prepared by David Schaeffer Engineering Ltd. and J.F. Sabourin and Associates Inc.;
6. Copy of memorandum from David Gilbert of Paterson Group Inc. to David Schaeffer Engineering Ltd., dated February 25, 2014;
7. E-mail from Kevin Murphy of David Schaeffer Engineering Ltd. to the Ministry, dated March 24, 2014;
8. Revision to Application for Environmental Compliance Submission by letter from Matt Wingate of David Schaeffer Engineering Ltd. through the City of Ottawa to the Ministry, dated September 19, 2014;
9. Copy of letter from Florence Robinson of Hydro One Networks Inc. to Matt Wingate of David Schaeffer Engineering Ltd., dated May 29, 2014;
10. Pipe Date Form and Storm Sewer Design Sheet, dated May 27, 2014, prepared by David Schaeffer Engineering Ltd.;
11. Design Brief for Cardinal Creek Village Phases 1A & 1B, dated May 29, 2014, prepared by David Schaeffer Engineering Ltd.;

12. Stormwater Management Report for Phase 1 of Cardinal Creek Village , dated May 2014,prepared by J.F. Sabourin and Associates Inc.;
13. Plan of Subdivision of Part of Lots 25, 26, 27, 28 and 29, Concession 1 (Old Survey), undated,prepared by Stantec Geomatics Ltd.;
14. Plan of Subdivision of Part of Lots 27 and 28, Concession 1 (Old Survey), undated, prepared by Stantec Geomatics Ltd.;
15. Set of Engineering Drawings (30 drawings) for Cardinal Creek Village Phase 1, Pond ECA Application, dated May 27, 2014, prepared by David Schaeffer Engineering Ltd.; including 4 drawings dated May 15, 2014 and 3 drawings dated March 26, 2014, prepared by G.D. Jewell Engineering Inc.;
16. Set of Engineering Drawings (21 drawings) for Cardinal Creek Village Phase 1, ECA Direct Submission Application, Rev 1 Additional Attachments for Storm Sewers & Ditches), dated May 27,2014, prepared by David Schaeffer Engineering Ltd.;
17. E-mail from Matt Wingate of David Schaeffer Engineering Ltd. to the Ministry, dated September 25, 2014;
18. E-mail from Matt Wingate of David Schaeffer Engineering Ltd. to the Ministry, dated September 26,2014.
19. Pipe Data Form;
20. Sanitary Sewer & Storm Sewer Description Sheets, prepared by DSEL, dated September 2017;
21. Sanitary Sewer & Storm Design Sheets, prepared by DSEL, dated September 2017;
22. Engineering Drawings, prepared by DSEL, Revision 1, dated September 12, 2017;
23. Design Brief for Cardinal Creek Village Phase 4 prepared by DSEL, Submission 2, dated September 2017;
24. Stormwater Management Report for Phase 4 of Cardinal Creek Village, prepared by JFSA, dated September 2017;
25. Design Brief for Interim Stormwater Management Pond 1 for Phases 1,2,3, and 4 in Cardinal Creek Village, prepared by JFSA, dated July 2017;

26. Geotechnical Reports
 - a. Geotechnical Review – Grading and Services – Cardinal Creek Village - Phase 4 – Old Montreal Road – Ottawa, prepared by Paterson Group, dated July 20, 2017;
 - b. Grading Plan Review – Cardinal Creek Village Phase 4 – Old Montreal – Ottawa, prepared by Paterson Group, dated August 29, 2017;
 - c. Geotechnical Review – Response to Engineering Comments – Cardinal Creek Village – Phase 4 – Old Montreal Road – Ottawa, prepared by Paterson Group, dated August 31, 2017;
27. Record of MOECC Pre-Consultation:
 - a. Pre-submission Consultation Request Form, dated August 3, 2017;
 - b. City of Ottawa Confirmation of Transfer of Review, dated September 14, 2017;
28. Conservation Authority Letter of Approval;
29. Articles of Incorporation, dated April 18, 2011;
30. Draft Plan of Subdivision for Cardinal Creek Village (All Phases), prepared by Stantec, dated December 13, 2013;
31. Conditions of Draft Approval – Cardinal Creek Village (All Phases) prepared by City of Ottawa, dated April 7, 2014;
32. Draft of M-Plan for Cardinal Creek Village Phase 4, prepared by Stantec, dated June 14, 2017;
33. Source Protection Maps, prepared by DSEL, dated July 2017:
 - a. Environmental Constraints;
 - b. Highly Vulnerable Aquifers;
 - c. Natural Heritage Areas;
 - d. Significant Groundwater Recharge Areas;
 - e. Water Intake Protection Areas;
 - f. Wellhead Protection Areas;
34. Official Plan Map, prepared by DSEL, dated July 2017;

35. Zoning Map, prepared by DSEL, dated July 2017;
36. Site Location Map, prepared by DSEL, dated August 2017;
37. Past MOECC Approvals:
 - a. Environmental Compliance Approval for Cardinal Creek Village – Phase 1 Storm Sewers, Sanitary Sewers, and Stormwater Management Facility [ECA #0029-9P9RLU, dated September 26, 2014];
 - b. Environmental Compliance Approval for Cardinal Creek Village – Phase 2 Storm Sewers and Sanitary Sewers [ECA #3548-9UCJYM, dated March 10, 2015];
 - c. Environmental Compliance Approval for Cardinal Creek Village – Phase 3 Storm Sewers and Sanitary Sewers [ECA #3610-AAFH8K, dated June 01, 2016];
38. Notice of Completion of Class Environmental Assessment;
39. Agent Letter of Authorization from Owner, Email from Michelle Taggart, dated April 30, 2014;
40. Laporte Agreement with Tamarack (Cardinal Creek) Corporation, dated September 2013; and
41. Questionnaire Regarding Environmental Bill of Rights (EBR) Requirements – Equivalent Public Participation.

SCHEDULE 'B'

Table 1: Effluent Monitoring

(Samples to be collected from the influent and effluent streams of the Pond 1, specifically at the outfall from the 2250mm diameter outlet pipe discharging from Pond 1 to the culvert under Ottawa Road 174)

Sample Type	Grab
Frequency	Three (3) rainfall <i>Wet Events</i> per year, with two (2) of the events occurring between May and September
Parameters	Total Suspended Solids, Phosphorus and Temperature

REASONS

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the Works are constructed and operated in the manner in which they were described and upon which approval was granted. This condition is also included to emphasize the precedence of conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.
2. Condition 2 is included to ensure that, when the Works are constructed, the Works will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.
3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to approved Works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.
4. Condition 4 is included as regular inspection and necessary removal of sediment and excessive decaying vegetation from the Works are required to mitigate the impact of sediment, debris and/or decaying vegetation on the treatment capacity of the Works. The Condition also ensures that adequate storage is maintained in the Works at all times as required by the design. Furthermore, this Condition is included to ensure that the Works are operated and maintained to function as designed. Condition 4. 1 is included to prevent the operation of stormwater pipes and other conveyance until such time that their required associated stormwater management Works are also constructed.
5. Condition 5 is included as installation, regular inspection and maintenance of the temporary sediment and erosion control measures is required to mitigate the impact on the downstream receiving watercourse during construction until they are no longer required.
6. Condition 6 is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives specified in the Approval and that the Works do not cause any impairment to the receiving watercourse or the environment. Condition 6.1 & 6.2 are included to ensure that relevant groundwater attributes are observed, monitored and documented during construction. Such information will be used after construction, in case of problems arising from complex hydrogeological and geotechnical conditions.
7. Condition 7 is included to ensure that established and accepted procedures are used during construction of the Works to minimize the potential for adverse environmental impacts on the receiver.

8. Condition 8 is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this Approval, so that the Ministry can work with the Owner in resolving any problems in a timely manner.
9. Condition 9 is included to ensure that the Works conform to the policies of the local Source Water Protection Plan.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 0029-9P9RLU issued on September 26, 2014.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

- a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
- b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of
the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 31st day of October, 2017



Christina Labarge, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

VT/

c: District Manager, MOECC Ottawa
Water Supervisor, MOE Ottawa office
Josh White, P. Eng., City of Ottawa (File No.: D07-16-13-0024PH4)
Charles Warnock, P. Eng., City of Ottawa (File No.: D07-16-13-0024PH4)
Linda Carkner, Program Manager ROW Information and Approvals at City of Ottawa (File No.:
D07-16-13-0024PH4)
Laura Maxwell, David Schaeffer Engineering Ltd.
Matt Wingate, P. Eng., David Schaeffer Engineering Ltd.

From: Adams, Reed <reed.adams@ottawa.ca>
Sent: May 13, 2026 11:19 AM
To: Braden Kaminski
Subject: Re: 1213 Montreal Road Chat

Morning Braden,

Thanks for the follow up. I agree with everything you laid out and don't have anything else to add.

Staying tuned for the BC request.

Thanks again,

Reed

Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Braden Kaminski <BKaminski@dsel.ca>
Sent: Wednesday, May 13, 2026 11:01 AM
To: Adams, Reed <reed.adams@ottawa.ca>
Subject: RE: 1213 Montreal Road Chat

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Morning Reed,

Thanks again for the call on Friday afternoon to discuss this project. Following up with some quick notes for our records. Let us know if you have anything to add.

- Rear yard grading network for the western portion of the site will be directed to the RYCB in Block 2 with a solid lead to a road CB on Famille Laporte. Excess flow will spill to Famille Laporte as shown in the preliminary sketch below (grades shown are still subject to change).



- Related to Comment #13 in the attached feedback form - the site won't be controlled to the exact minor system release rate previously considered for the school block, but downstream capacity in the sewers and Pond 1 will be demonstrated as part of the engineering design submission.
- A Servicing Options Report is not required. The servicing studies will comment on how the proposed design differs from the approved MSS and CCV Ph4 designs.
- The watermain boundary conditions request will be directed to you. I'm hoping we should have this circulated later this afternoon.
- This site was included in the broader Water Budget Assessment done for the entirety of CCV completed in 2013. Additionally, water budget compensation measures related to the North Tributary of Cardinal Creek have already been implemented as part of the existing CCV Ph4. As such, a new water budget assessment will not be completed, and the servicing study will include relevant excerpts from the 2013 CCV Water Budget Assessment and the Phase 4 design.

Thanks again,

Braden Kaminski, P.Eng
Project Manager



Toronto
600 Alden Road, Suite 606
Markham, ON L3R 0E7
905-475-3080



Ottawa
120 Iber Road, Suite 103
Stittsville, ON K2S 1E9
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phone: (613) 845-2107
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Appendix C



Hydraulic Capacity and Modeling Analysis Cardinal Creek Village Phase 8

Technical Memorandum

FINAL

Prepared for:

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Submission Date: July 13, 2026

Contact: Mr. Werner de Schaetzen, Ph.D., P.Eng.

Project: 2026-068-DSE

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Document History and Version Control

Revision No.	Date	Document Description	Revised By	Reviewed By
R0	June 15, 2026	Draft	Leon Wang	Werner de Schaetzen
R1	July 09, 2026	Updated Draft	Leon Wang	Werner de Schaetzen
R2	July 13, 2026	Final	Leon Wang	Werner de Schaetzen
R3	July 13, 2026	Updated Final	Leon Wang	Werner de Schaetzen

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1 Introduction

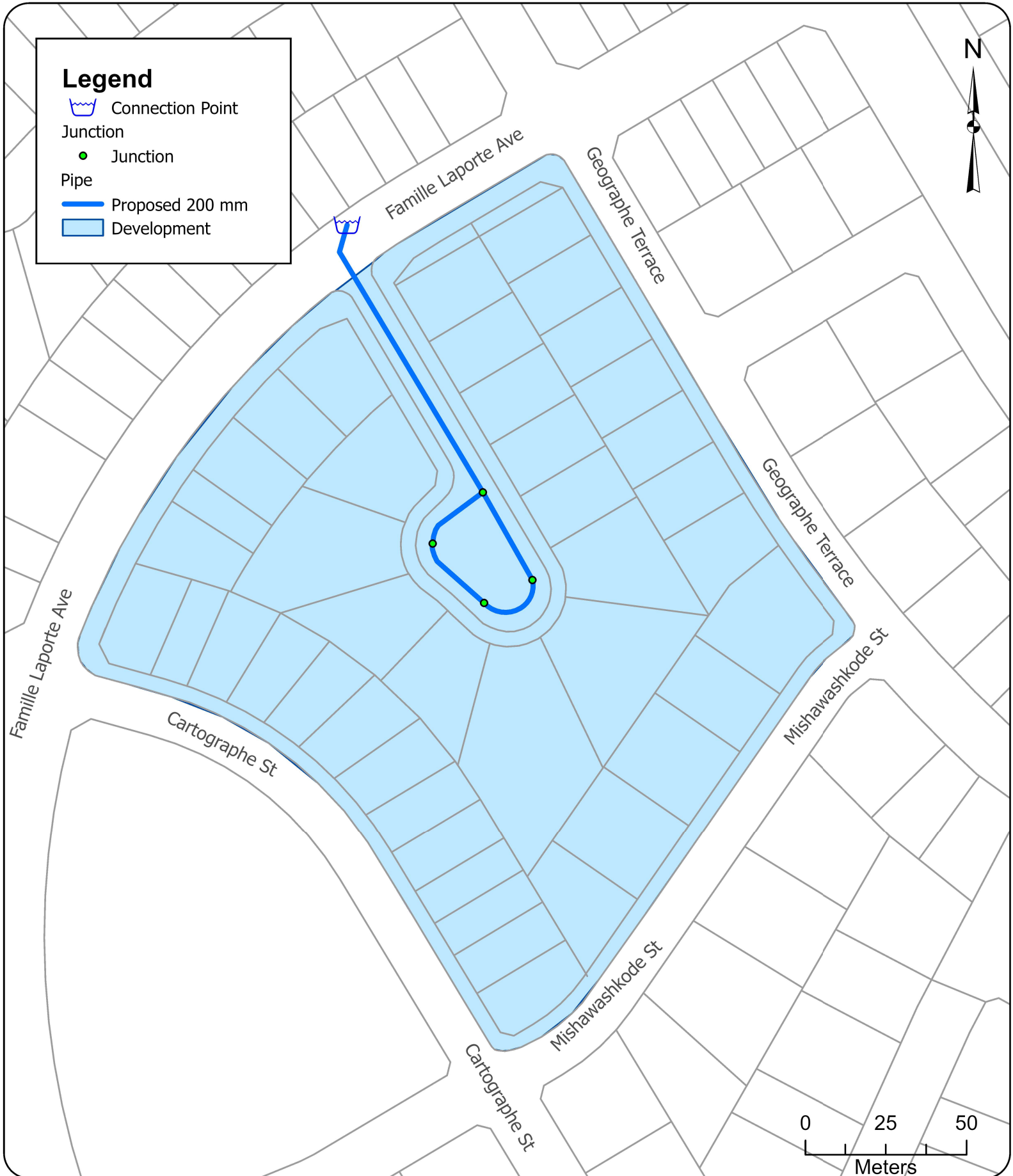
GeoAdvice Engineering Inc. (“GeoAdvice”) was retained by David Schaeffer Engineering Ltd. (“DSEL”) to size the proposed water main network for the Cardinal Creek Village Phase 8 (“Development”) in the City of Ottawa, ON (“City”).

The development will have one (1) connection to the City’s water distribution system along Famille-Laporte Avenue. The development site is shown in **Figure 1.1** on the following page, with the final recommended pipe diameters.

Historically, this 2.1-hectare parcel was designated as a school block, as detailed in the *Hydraulic Capacity and Modeling Analysis Cardinal Creek Village Development Phase 4* report prepared by GeoAdvice in October 2017. The original design assumed a 300 mm fronting water main along Famille-Laporte Avenue to service the school. Since then, the site has been redesigned into a residential layout comprising forty-six (46) semi-townhomes and one (1) single detached dwelling, with the fronting water main along Famille-Laporte Avenue resized to 200 mm.

This memo describes the assumptions and results of the hydraulic modeling and capacity analysis using InfoWater Pro (Autodesk Software), a GIS water distribution system modeling and management software application.

The results presented in this memo are based on the analysis of steady state simulations. The predicted available fire flows, as calculated by the hydraulic model, represent the flow available in the water main while maintaining a residual pressure of 20 psi. No extended period simulations were completed in this analysis to assess the water quality or to assess the hydraulic impact on storage and pumping.





2 Modeling Considerations

2.1 Water Main Configuration

The proposed water main network was delineated by GeoAdvice based on the internal road alignments and property boundaries shown on the site plan (CCV Phase 8 MPlan.pdf) provided by Stantec on July 3, 2026.

2.2 Elevations

Elevations of the modeled junctions were assigned according to a site base plan prepared by DSEL (1480_grad-coord.dwg) and provided to GeoAdvice on June 12, 2026.

2.3 Consumer Demands

The residential demands for the development were provided by DSEL as summarized in **Table 2.1** and were uniformly distributed to all junctions within the development. Allocating the total demand exclusively to the internal junctions of the development yields a more conservative approach, as in reality, a portion of these demands would likely be distributed to the surrounding external water network.

Detailed demand calculations are provided in **Appendix A**.

Table 2.1: Development Water Demands

Scenario	Demand (L/s)
Average Day Demand (ADD)	0.42
Max Day Demand (MDD)	1.05
Peak Hour Demand (PHD)	2.30

2.4 Fire Flow Demand

Fire flow demands are typically determined in accordance with the Fire Underwriters Survey's Water Supply for Public fire Protection guideline (2020). FUS calculations are based on the types of building, floor area, number of storeys, construction class, occupancy class and exposure factor.

The City of Ottawa Technical Bulletin (Bulletin) ISTB-2018-02 allows provision for the required fire flow to be capped at 10,000 L/min (167 L/s) if there is a minimum of 10 m of separation between the backs of adjacent single detached dwellings and semi-townhomes. As confirmed by the DSEL and verified by GeoAdvice, the single detached dwellings as well as semi-townhomes are expected to comply with the provisions set out in Bulletin ISTB-2018-02. Therefore, the fire flow requirement for the Cardinal Creek Village Phase 8 is capped at 167 L/s, since no other land use is present.



2.5 Boundary Conditions

The boundary conditions were provided by the City of Ottawa in the form of Hydraulic Grade Line (HGL) at the following six locations:

- Connection 1: Watermain on Famille Laporte Ave and Rue Du Cartographe.
- Connection 2: Watermain on Famille Laporte Ave.
- Connection 3: Watermain on Mishawashkode St and Geographe Terr.

Boundary conditions were provided for Average Day Demand (ADD), Peak Hour Demand (PHD), and Maximum Day Demand plus Fire Flow (MDD+FF) conditions. The City boundary conditions were provided to GeoAdvice on May 15, 2026, summarized in **Table 2.3**, and details can be found in **Appendix B**.

Table 2.3: Boundary Conditions

Condition	Connection 1* HGL (m)	Connection 2* HGL (m)	Connection 3** HGL (m)
ADD	115.1	115.1	130.2
PHD	109.5	109.5	127.0
MDD + FF	102.5	100.8	123.2

*Connected within pressure zone 1E

**Connected within pressure zone 2E

To evaluate the proposed network under the most stringent operating conditions, the hydraulic analysis was conducted utilizing Connection 2 as the sole boundary condition for the site, based on two primary engineering justifications:

- As summarized in **Table 2.3**, Connection 2 provides the lowest available HGL at 100.8 m during MDD+FF scenario, ensuring the most conservative pressure simulation for the network
- As illustrated in the site plan layout in **Figure 1.1**, the internal water main is designed as an isolated cul-de-sac system stubbed off Famille-Laporte Avenue. Because the block operates hydraulically as a single-feed branch network with no secondary looping to external boundary connections, isolating the simulation to Connection 2 accurately models the real-world dead-end behavior of the infrastructure.



3 Hydraulic Capacity Design Criteria

3.1 Pipe Characteristics

Pipe characteristics of internal diameter (ID) and Hazen-Williams C factors were assigned in the model according to *Ottawa Design Guidelines* for PVC water main material. Pipe characteristics used for the development are outlined in **Table 3.1** below.

Table 3.1: Model Pipe Characteristics

Nominal Diameter (mm)	ID PVC (mm)	Hazen Williams C-Factor (/)
200	204	110

3.2 Pressure Requirements

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi). Pressure requirements are outlined in **Table 3.2**.

Table 3.2: Pressure Requirements

Demand Condition	Minimum Pressure		Maximum Pressure	
	(kPa)	(psi)	(kPa)	(psi)
Normal Operating Pressure (maximum daily flow)	350	50	480	70
Peak Hour Demand (minimum allowable pressure)	276	40	-	-
Maximum Fixture Pressure (Ontario Building Code)	-	-	552	80
Maximum Distribution Pressure (minimum hour check)	-	-	552	80
Maximum Day Plus Fire	140	20	-	-



4 Hydraulic Capacity Analysis

The proposed water mains within the development were sized to the minimum diameter which would satisfy the greater of maximum day plus fire and peak hour demand. Modeling was carried out for average day demand, peak hour demand and maximum day demand plus fire flow using InfoWater Pro.

Further pipe size optimization (e.g., upsizing the pipe diameter from 200 mm to 250 mm to mitigate pipe velocities exceeding the 3.5 m/s threshold under MDD+FF scenarios) may be considered but was outside the scope of this high-level study.

4.1 Development Pressure Analysis

Modeled service pressures for the development are summarized in **Table 4.1**.

Table 4.1: Summary Available Service Pressures

Average Day Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
65 psi (448 kPa)	55 psi (382 kPa)

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi).

As shown in **Table 4.1**, the modeled maximum pressure of 448 kPa (65 psi) under ADD and the minimum pressure of 382 kPa (55 psi) under PHD are both well within the City's preferred operating range. Consequently, the system will maintain excellent service pressures without the need for pressure reducing valves (PRVs) or booster facilities. Detailed maps illustrating the pressure modeling results can be found in **Appendix C**.

4.2 Development Fire Flow Analysis

Table 4.2: Summary of Minimum Available Fire Flows

Required Fire Flow	Minimum Available Flow*
167 L/s	175 L/s

As shown in **Table 4.2**, the fire flow requirements can be met at all junctions within the development.

Detailed fire flow results illustrating the fire flow results can be found in **Appendix D**.



Submission

Prepared by:

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Hydraulic Modeler

Approved by:

July 13, 2026
W. B. F. de Schaetzen
100116349

Werner de Schaetzen, Ph.D., P.Eng.
Senior Modeling Review / Project Manager



Appendix A Domestic Water Demand Calculations

1213 Old Montreal Road Demands

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day 2.5 x Avg. Day (L/s)**	Fire Flow* (L/s)	Peak Hour 2.2 x Max Day (L/s)**
		Persons per unit	Population	(L/c/d)	(L/d)	(L/s)			
Single Detached	1	3.4	4	280	1120	0.01	0.03	167	0.07
Townhomes	46	2.7	125		35000	0.41	1.01	167	2.23
TOTAL	47		129		36120	0.42	1.05		2.30

*Assumed per ISDTB-2014-02. FUS calculations will be conducted at a later date.

**Determined using City of Ottawa Design Guidelines. Peaking factors based on the Phase 4 development population of 500-3000 capita.



Appendix B Boundary Conditions

Boundary Conditions 1213 Old Montreal Rd – 2026

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	25.2	0.42
Maximum Daily Demand	63.0	1.05
Peak Hour	138.0	2.30
Fire Flow Demand #1	10,020.0	167.00
Fire Flow Demand #2	15,000.0	250.00

Location



Results

Connection 1 - Famille Laporte Ave and Rue Du Cartographe

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	115.1	70.0
Peak Hour	109.5	61.9
Max Day plus Fire Flow #1	102.5	52.1
Max Day plus Fire Flow #2	94.80	41.1

¹ Ground Elevation = 65.9 m

Connection 2 - Famille Laporte Ave

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	115.1	65.4
Peak Hour	109.5	57.4
Max Day plus Fire Flow #1	100.8	45.1
Max Day plus Fire Flow #2	91.20	31.4

¹ Ground Elevation = 69.1 m

Connection 3 - Mishawashkode St and Geographe Terr

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	130.2	82.8
Peak Hour	127.0	78.2
Max Day plus Fire Flow #1	123.2	72.9
Max Day plus Fire Flow #2	118.4	66.0

¹ Ground Elevation = 72.0 m

Notes

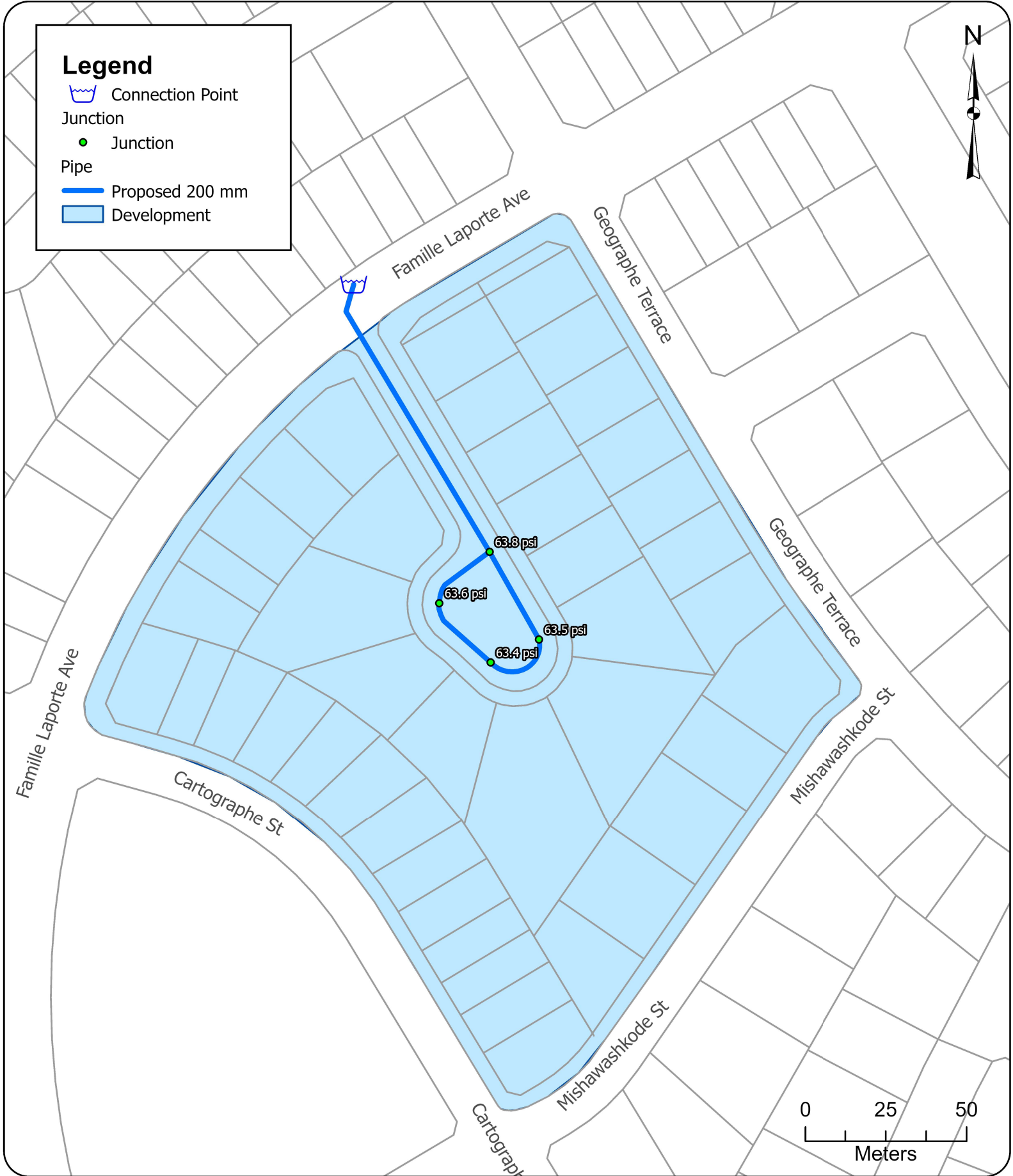
1. Any connection to a watermain 400 mm or larger should be approved by DWS as per the Water Design Guidelines Section 2.4 Review by Drinking Water Services.
2. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
 - If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
 - Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.
3. The HGL discrepancy between Connections 1 & 2 versus Connection 3 exists because the former are found within pressure zone 1E and the latter is found within pressure zone 2E.

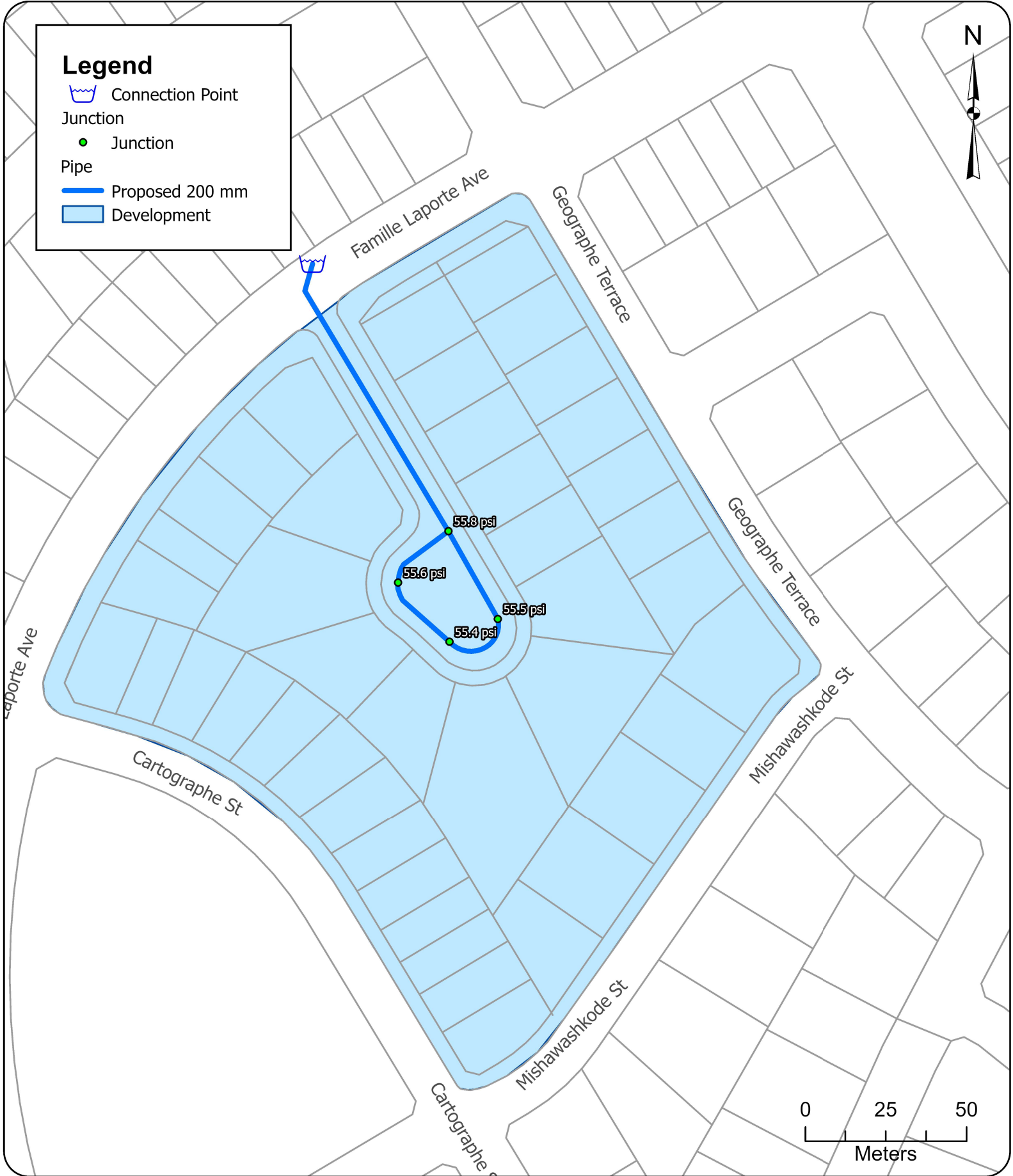
Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.



Appendix C ADD and PHD Model Pressure Results





GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis
Cardinal Creek Village Phase 8
2026-068-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **July 2026**
Created by: **LW**
Reviewed by: **WdS**

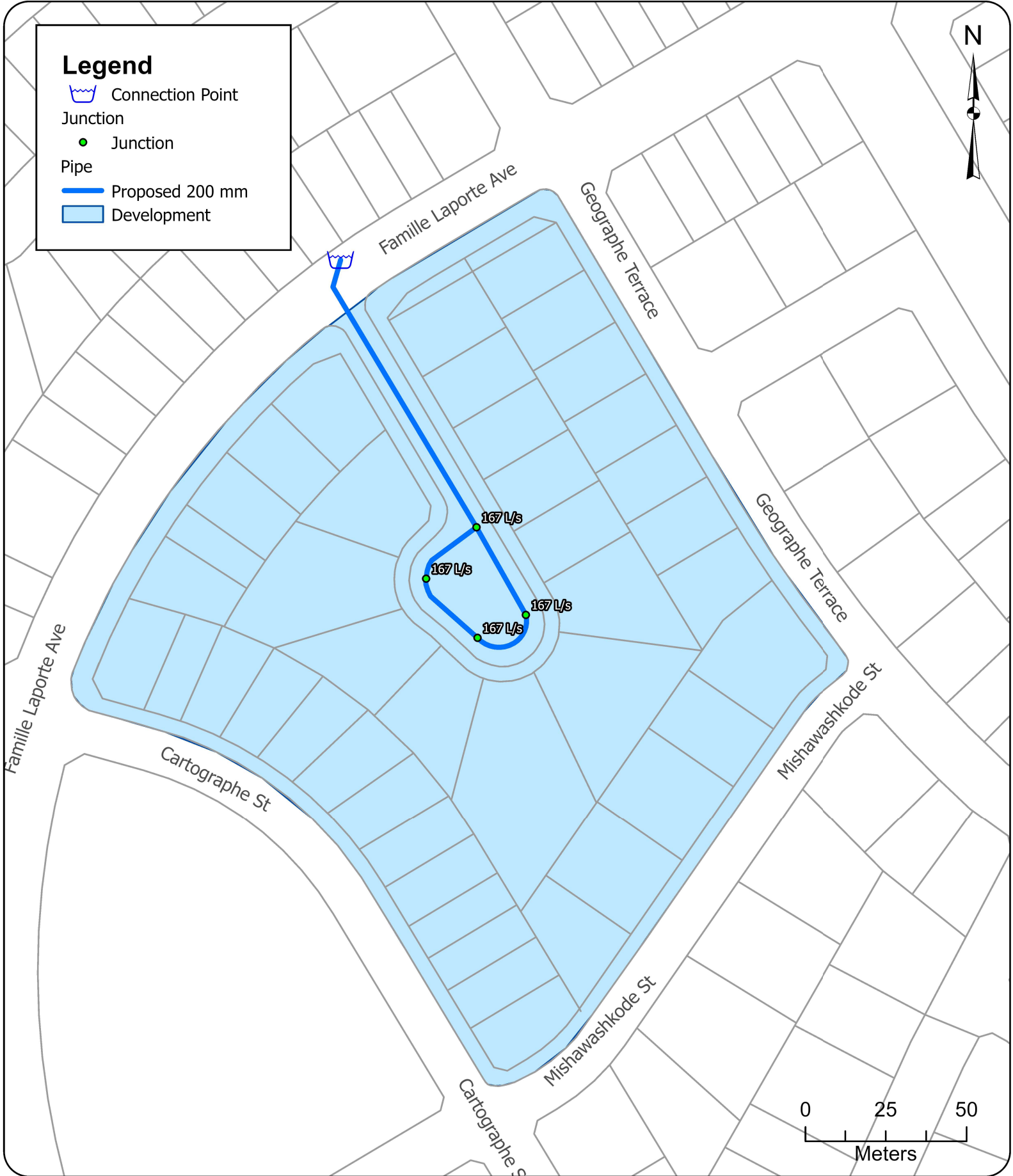
DISCLAIMER: GeoAdvice does not warrant in any way the accuracy and completeness of the information shown on this map. Field verification of the accuracy and completeness of the information shown on this map is the sole responsibility of the user.

**PHD
Pressure Results**

Appendix C.2



Appendix D Fire Flow Modeling Results



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**

Cardinal Creek Village Phase 8

2026-068-DSE

Client: **David Schaeffer Engineering Ltd.**

Date: **July 2026**

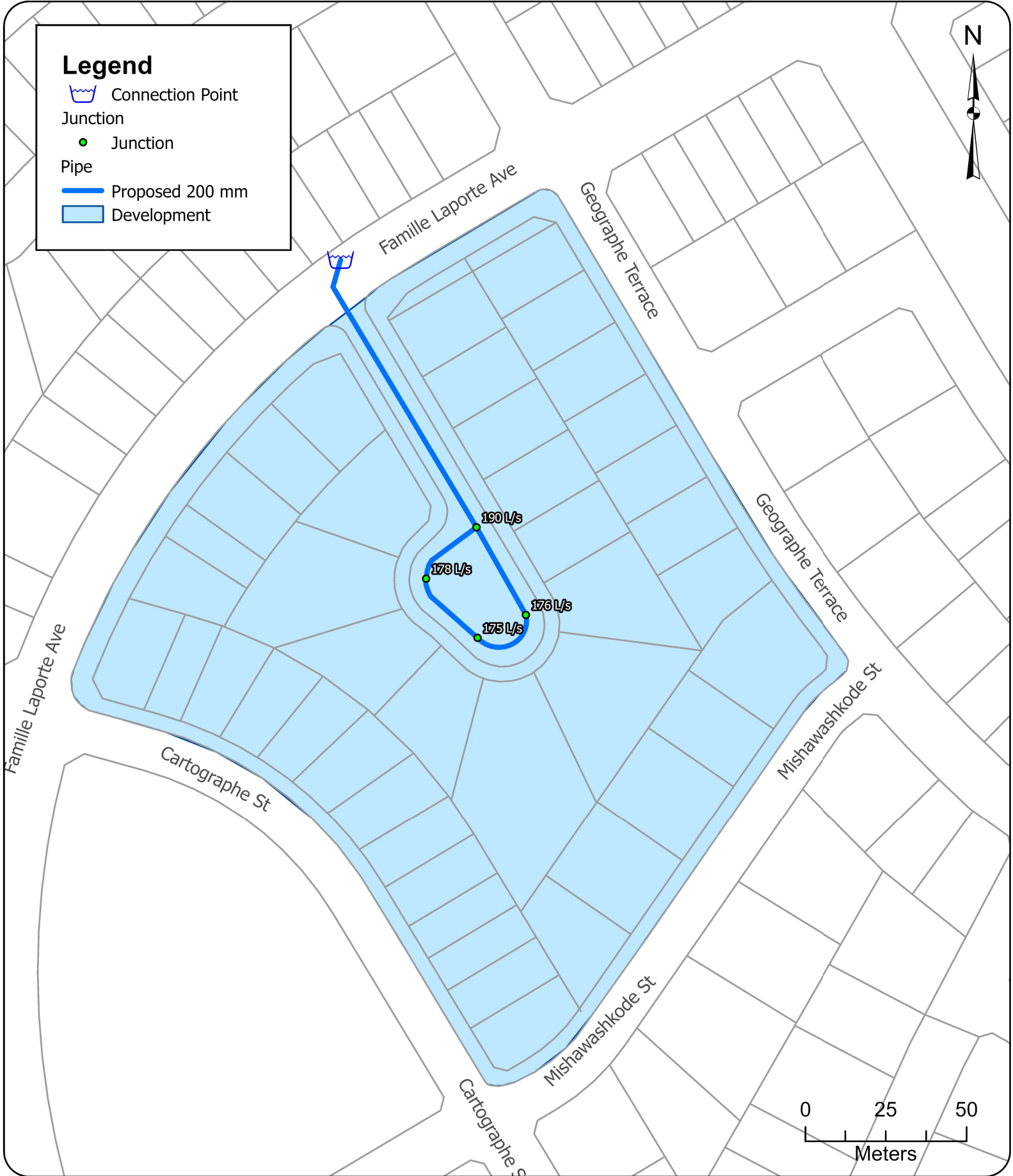
Created by: **LW**

Reviewed by: **WdS**

DISCLAIMER: GeoAdvice does not warrant in any way the accuracy and completeness of the information shown on this map. Field verification of the accuracy and completeness of the information shown on this map is the sole responsibility of the user.

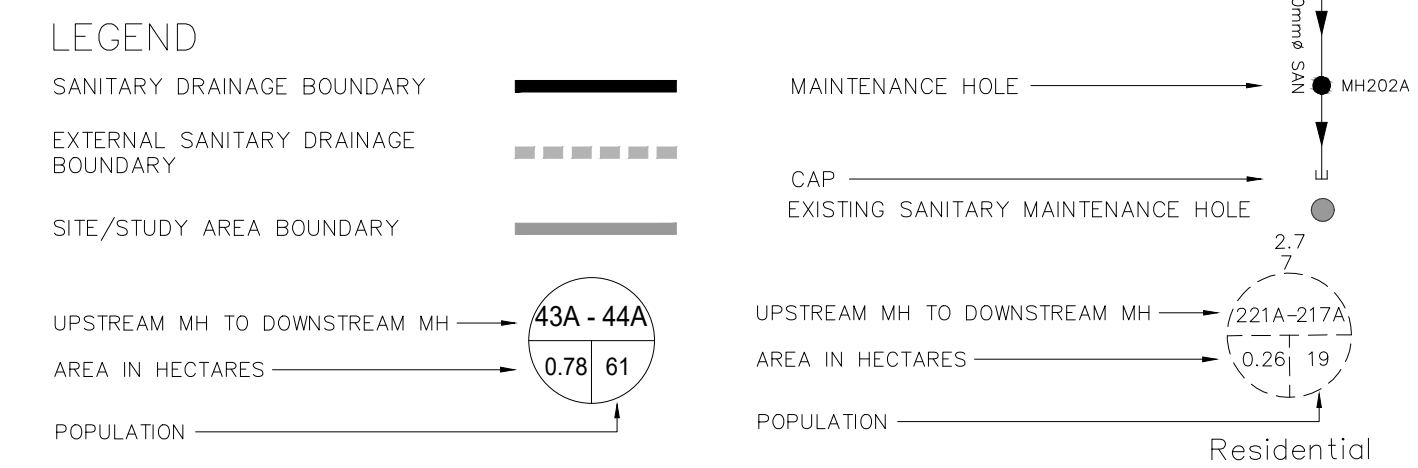
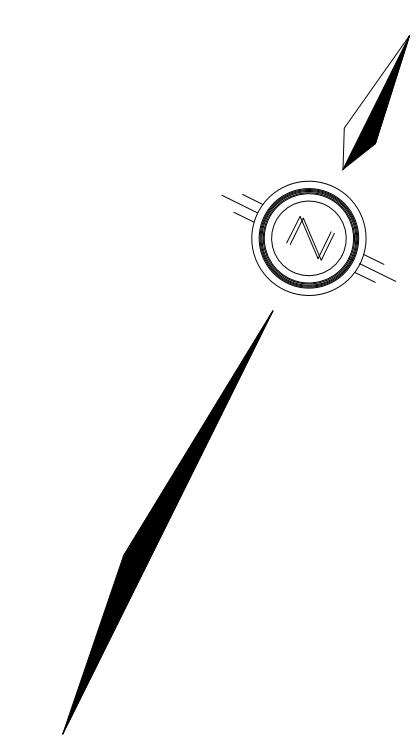
**MDD+FF
Required Fire Flow**

Appendix D.1



Appendix D

Manning's $n=0.013$ [illegible]

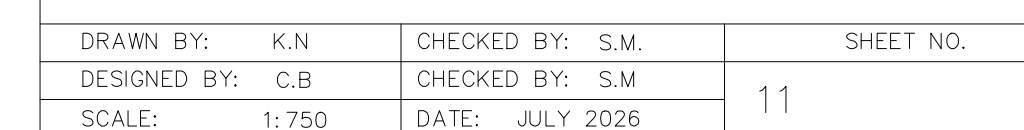
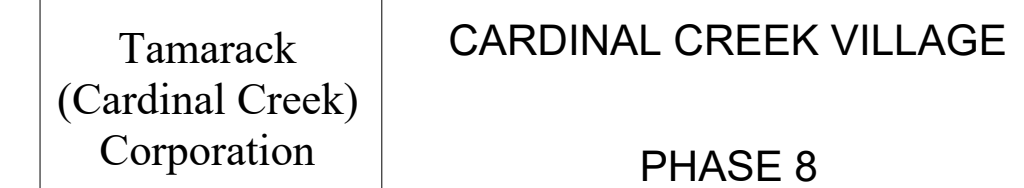


TOPOGRAPHIC INFORMATION
TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC GEOMATICS LTD.,
PROJECT No. 161614995-111. SURVEY DATED APRIL 28, 2026.

LEGAL INFORMATION
M-PLAN PROVIDED BY STANTEC GEOMATICS LTD., PROJECT No.
161614995-132, RECEIVED ON JULY 3, 2026.

ELEVATION NOTE
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM
AND ARE DERIVED FROM THE CAN-NET VRS NETWORK MONUMENT:
OTTAWA ELEVATION=95.230.

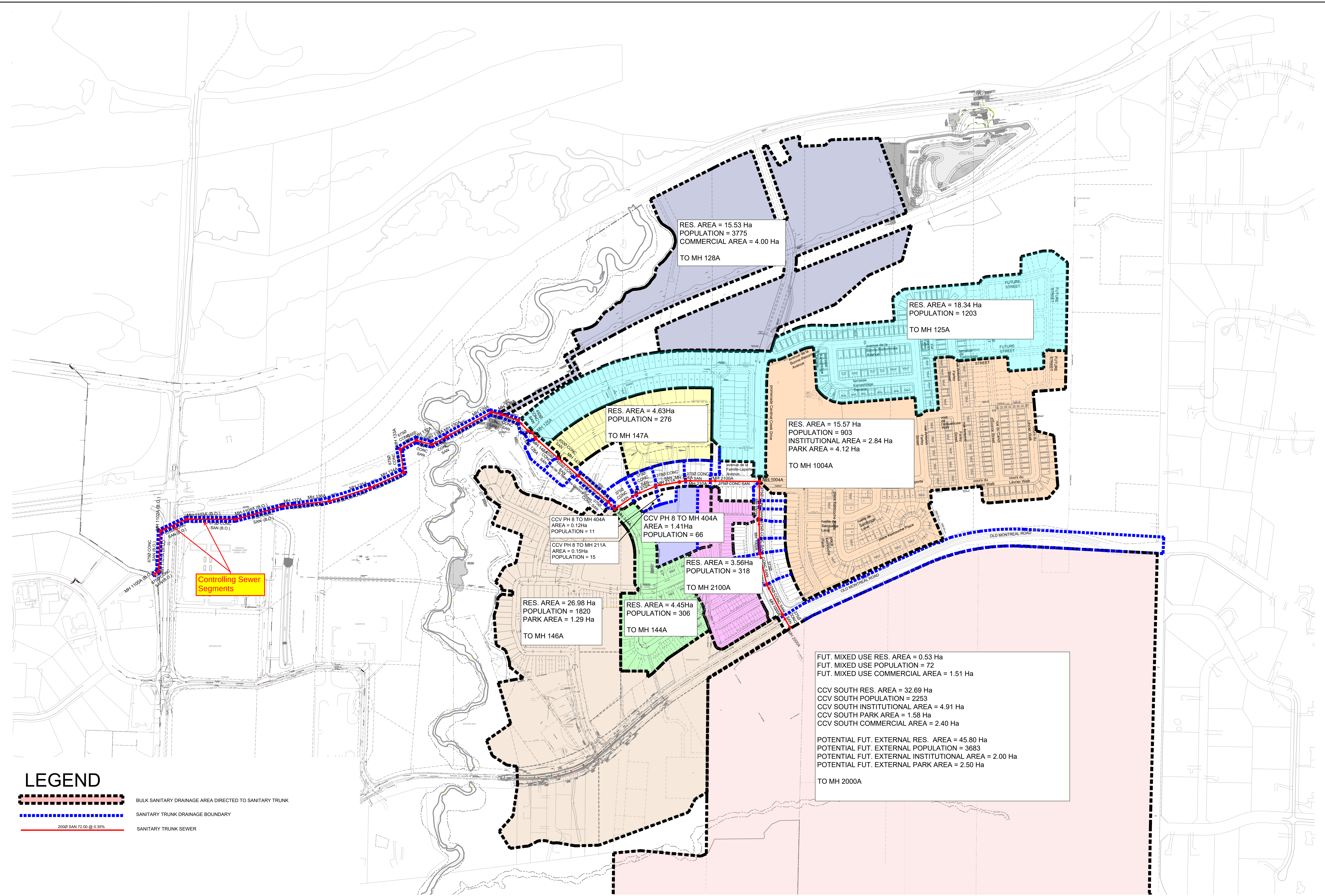
 CITY OF
OTTAWA



[illegible]

Manning's $n=0.013$

DESIGN PARAMETERS										Designed: GGG		PROJECT: Ultimate Cardinal Creek Village Sanitary Trunk Sewer			
Park Flow =	9300	L/ha/da	0.10764	I/s/ha						Checked: SLIM	LOCATION: City of Ottawa				
Average Daily Flow =	280	I/p/day			Industrial Peak Factor = as per MOE Graph										
Comm/Inst Flow =	28000	L/ha/da	0.3241	I/s/ha	Extraneous Flow = 0.330 L/s/ha										
Industrial Flow =	35000	L/ha/da	0.40509	I/s/ha	Minimum Velocity = 0.600 m/s										
Max Res. Peak Factor =	4.00			(Conc) 0.013 (Pvc) 0.013											
Commercial/Inst./Park Peak Factor =	1.00			Townhouse coeff= 2.7					Dwg. Reference: TRUNK SANITARY SEWER ANALYSIS	File Ref:	Date: 13 Jul 2026	Sheet No. of 2			
Institutional =	0.32	I/s/ha			Single house coeff= 3.4										



LEGEND

- BULK SANITARY DRAINAGE AREA DIRECTED TO SANITARY TRUNK
- SANITARY TRUNK DRAINAGE BOUNDARY
- 2000 SAN 72.00 @ 0.35%
- SANITARY TRUNK SEWER

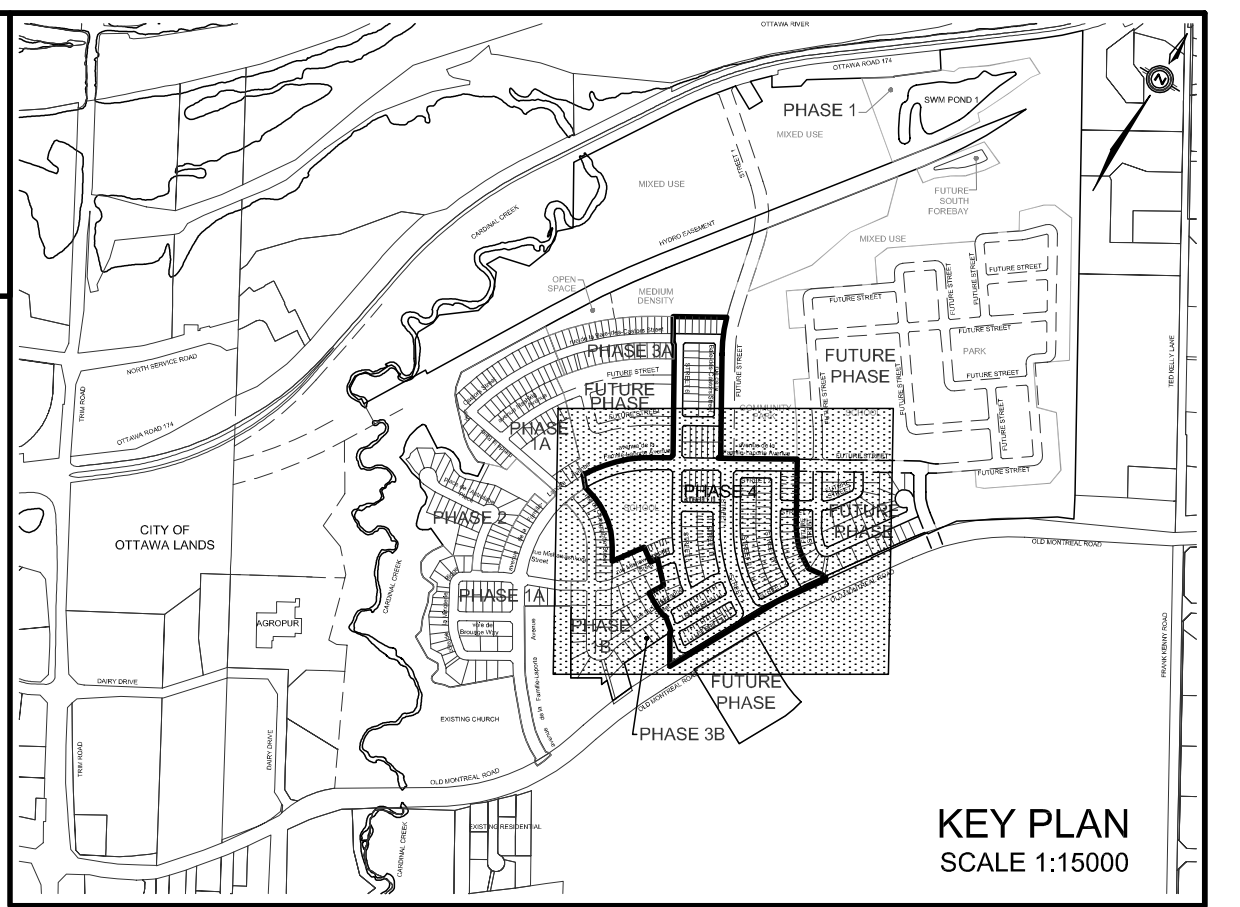


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CARDINAL CREEK VILLAGE SOUTH CITY OF OTTAWA

TRUNK SANITARY SEWER ANALYSIS

SCALE:	1:2500	PROJECT No.:	25-1480
DATE:	JULY 2026	FIGURE:	App. D



LEGEND

- SANITARY DRAINAGE BOUNDARY
SANITARY SUB-DRAINAGE BOUNDARY
UPSTREAM MH TO DOWNSTREAM MH
AREA IN HECTARES
POPULATION
EXTERNAL AREA IN HECTARES
EXTERNAL POPULATION
DENSITY (PERSONS/HECTARE)
EXTERNAL LAND USE
UPSTREAM MH TO DOWNSTREAM MH
AREA IN OTHER PHASES IN HECTARES
POPULATION
MAINTENANCE HOLE
CAP
OTHER PHASES
LIMIT OF HAZARD LANDS
6m EROSION ACCESS ALLOWANCE
100YR W.L. CARDINAL CREEK

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC GEOMATICS LTD., PROJECT No. 161611900-111
RECEIVED ON JULY 6, 2012 AND PROJECT No. 16162324-111 RECEIVED ON OCTOBER 24, 2013
AND NOVEMBER 29, 2013 AND PROJECT No. 161613473-111 RECEIVED ON MAY 10, 2016

LEGAL INFORMATION

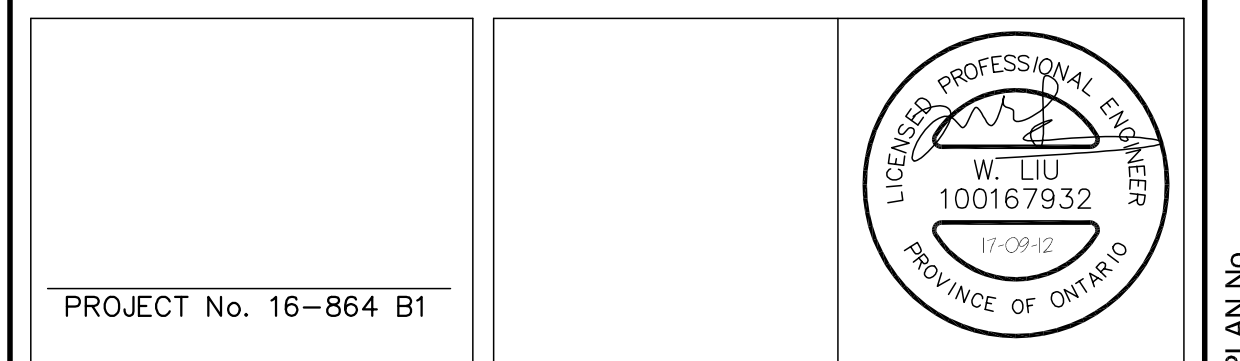
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161613473-114 DATED JUNE 15, 2016
2nd SUBMISSION 17-09-12

NOT FOR CONSTRUCTION

ELEVATION NOTE

ELEVATIONS HEREON ARE GEODETIC AND ARE DERIVED FROM THE CAN-NET VRS NETWORK.

No.	DATE	BY	DESCRIPTION	BY
2.	17-09-12	W.L.	2nd SUBMISSION	
1.	17-07-24	W.L.	1st SUBMISSION	



PROJECT No. 16-864 B1			
SANITARY DRAINAGE PLAN © DSEL			
TAMARACK (CARDINAL CREEK) CORPORATION	CARDINAL CREEK VILLAGE PHASE 4		
DSEL david schaeffer engineering ltd			
120 Iber Road, Unit 103 Stittville, ON K2S 1E9 Tel: (613) 836-0866 Fax: (613) 836-7183 www.DSEL.ca			
DRAWN BY: A.F./A.B.	CHECKED BY: C.M./W.L.	DRAWING NO.	SHEET NO.
DESIGNED BY: C.M./W.L.	CHECKED BY: K.M.		39
SCALE: 1:1000	DATE: JULY 2017		

SANITARY SEWER CALCULATION SHEET

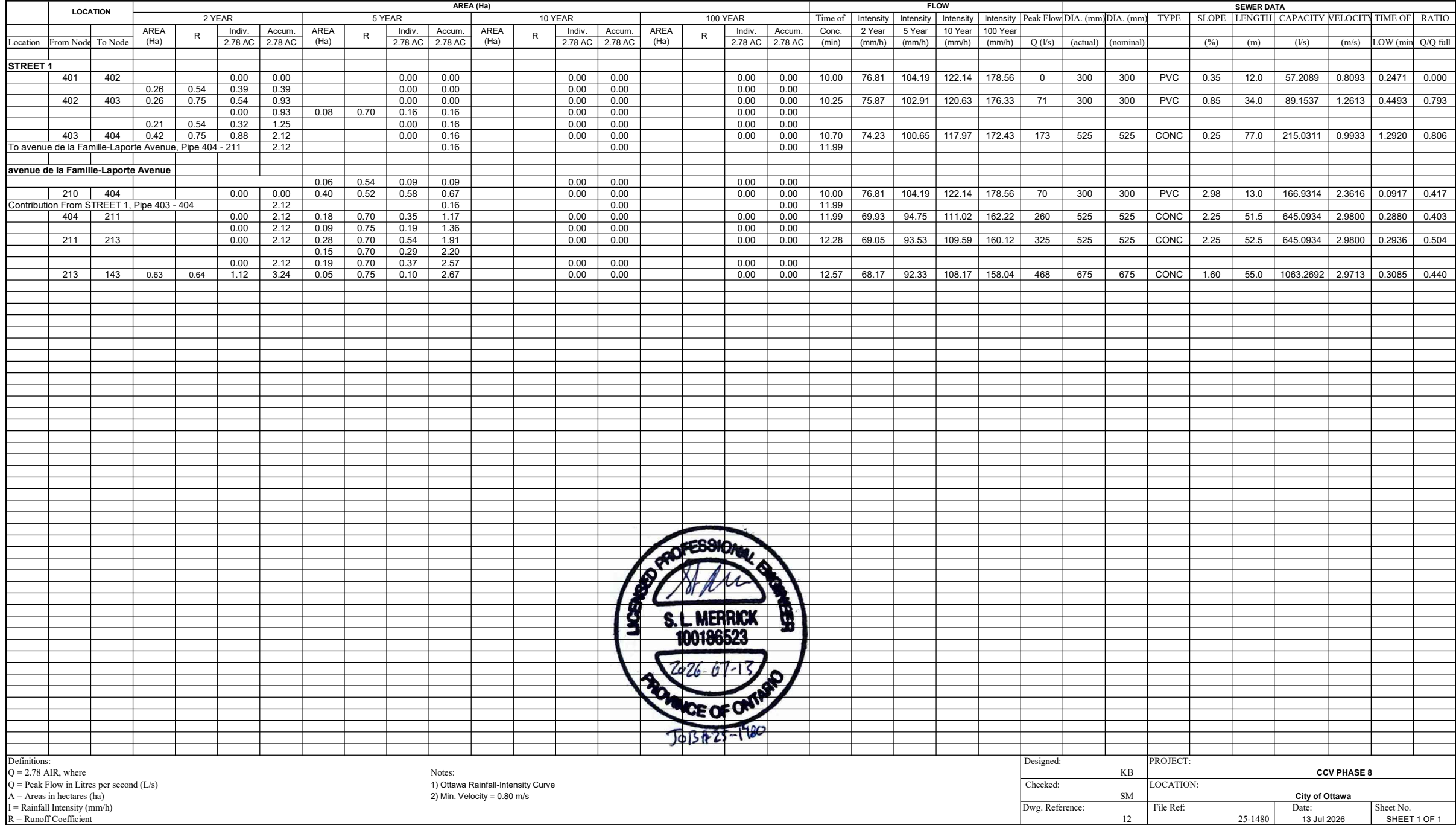


Manning's $n=0.013$

LOCATION				RESIDENTIAL AREA AND POPULATION						COMM		INDUST		INSTIT		C+I		INFILTRATION				PIPE						VEL.
STREET		FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha) POP.		PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	
Contribution from BLOCK 109 (School)				0.08	1	3.4	74.88	4891.7							2.09	2.09	1.81	2.09	2.09	0.59	2.40	14.0	200	1.00	32.80	0.07	1.04	
Ex. 212A		Ex. 144A		0.27	3	10.2	75.15	4901.9	3.25	64.54		1.88				9.82	8.45	0.27	86.58	24.32	97.31	57.0	375	1.70	228.60	0.43	2.07	
To rue de la Baie-des-Castors Street, Pipe Ex. 144A - Ex. 145A							75.15	4901.9				1.88				9.82			86.85									
STREET 6																												
		7000A	710A	0.37	5	17.0	0.37	17.0	4.00	0.28								0.37	0.37	0.10	0.38	66.0	200	1.80	44.00	0.01	1.40	
		710A	Ex. Plug	0.37	5	17.0	0.74	34.0	4.00	0.55								0.37	0.74	0.21	0.76	85.0	200	2.99	56.71	0.01	1.81	
		Ex. Plug	Ex. 706A				0.74	34.0	4.00	0.55								0.00	0.74	0.21	0.76	17.0	200	2.99	56.71	0.01	1.81	
To rue de la Baie-des-Castors Street, Pipe Ex. 706A - Ex. 707A							0.74	34.0										0.74										
rue de la Baie-des-Castors Street																												
		700A	701A	0.31	5	17.0	0.31	17.0	4.00	0.28								0.31	0.31	0.09	0.37	57.5	200	0.85	26.44	0.01	0.84	
		701A	702A	0.07	1	3.4	0.38	20.4	4.00	0.33								0.07	0.38	0.11	0.44	11.0	200	0.40	20.74	0.02	0.66	
		702A	703A	0.33	5	17.0	0.71	37.4	4.00	0.61								0.33	0.71	0.20	0.81	73.5	200	0.40	20.74	0.04	0.86	
		703A	704A	0.33	5	17.0	1.04	54.4	4.00	0.88								0.33	1.04	0.29	1.17	73.5	200	3.10	57.75	0.02	1.84	
Contribution from Future Park														4.10	4.10	0.66	4.10	4.10	1.15	1.81	8.0	200	1.00	32.80	0.08	1.04		
		704A	705A	0.08	1	3.4	1.12	57.8	4.00	0.94						4.10	0.66	0.08	5.22	1.46	3.06	12.0	200	0.40	20.74	0.15	0.66	
		705A	Ex. Plug	0.36	6	20.4	1.50	78.2	4.00	1.27						4.10	0.66	0.38	5.60	1.57	3.50	42.0	200	0.39	20.48	0.17	0.65	
		Ex. Plug	Ex. 706A				1.50	78.2	4.00	1.27						4.10	0.66	0.00	5.60	1.57	3.50	30.0	200	0.39	20.48	0.17	0.65	
Contribution From Street 6, Pipe Ex. Plug-Ex. 706A																												
				0.06	1	3.4	2.30	115.6								4.10		0.06	6.40									
		Ex. 706A	Ex. 707A	0.59	11	37.4	2.89	153.0	4.00	2.48						4.10	0.66	0.59	6.99	1.96	5.10	78.0	200	0.40	20.74	0.25	0.66	
To rue de la Baie-des-Castors Street, Pipe Ex. 707A - Ex. 708A							2.89	153.0								4.10			6.99									

Appendix E

		Local Roads Return Frequency = 2 years
		Collector Roads Return Frequency = 5 years
Manning	0.013	Arterial Roads Return Frequency = 10 years





LEGEND

STORM DRAINAGE BOUNDARY
SUB-DRAINAGE BOUNDARY
STORM DRAINAGE BOUNDARY (OTHER PHASES)
BOUNDARY (OTHER PHASES)

STORM FREQUENCY
UPSTREAM MH TO DOWNSTREAM MH

AREA IN HECTARES

RUNOFF COEFFICIENT
EXTERNAL 2.78AC =

EXTERNAL TIME OF CONCENTRATION
TC=14.5 MIN

EXTERNAL BLENDED RUNOFF COEFFICIENT
C=0.70 2YR

UPSTREAM MH TO DOWNSTREAM MH

AREA IN OTHER PHASES IN HECTARES

RUNOFF COEFFICIENT

STREET CATCHBASIN & LEAD
STREET CATCHBASIN WITH
CLOSED LID & LEAD
MAINTENANCE HOLE

CURB INLET CATCHBASIN & LEAD
CATCHBASIN/ MAINTENANCE HOLE
INTERCONNECTED CATCH
BASIN & LEADS
CAP

OVERLAND FLOW DIRECTION

EXTERNAL OVERLAND FLOW DIRECTION

EXISTING STORM MAINTENANCE HOLE

NOT FOR CONSTRUCTION

TOPOGRAPHIC INFORMATION
TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC GEOMATICS LTD.,
PROJECT No. 161614995-111, SURVEY DATED APRIL 28, 2026.

LEGAL INFORMATION
M-PLAN PROVIDED BY STANTEC GEOMATICS LTD., PROJECT No.
161614995-132, RECEIVED ON JULY 3, 2026.

ELEVATION NOTE
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM
AND ARE DERIVED FROM THE CAN-NET VRS NETWORK MONUMENT:
OTTAWA ELEVATION=95.230.

1	S.M.	26-07-13	1st SUBMISSION
No.	BY	DATE	DESCRIPTION

CITY OF OTTAWA

PROJECT No. 25-1480

PROFESSIONAL ENGINEER
S. L. MERRICK
100196523
2026-07-13
PROVINCE OF ONTARIO

Tamarack
(Cardinal Creek)
Corporation

CARDINAL CREEK VILLAGE
PHASE 8

DSEL

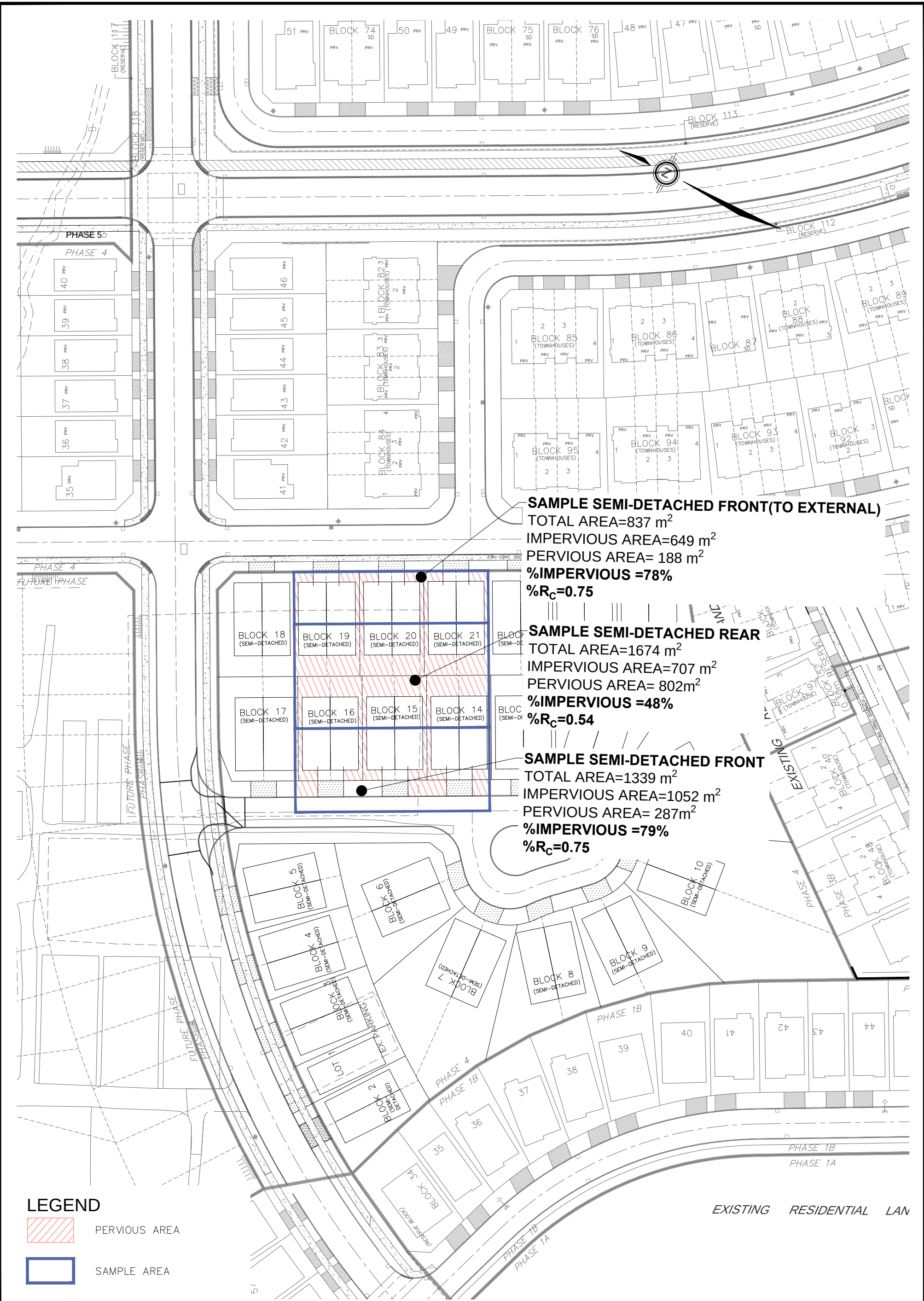
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9
Tel: (613) 836-0856
Fax: (613) 836-7153
www.DSEL.ca

STORM DRAINAGE PLAN

DRAWN BY: K.N.	CHECKED BY: S.M.	SHEET NO.
DESIGNED BY: C.B.	CHECKED BY: S.M.	12
SCALE: 1:750	DATE: JULY 2026	

CITY PLAN No. XXXXXX

CITY FILE No. XXXXXX



SAMPLE SEMI-DETACHED FRONT(TO EXTERNAL)
TOTAL AREA=837 m²
IMPERVIOUS AREA=649 m²
PERVIOUS AREA= 188 m²
%IMPERVIOUS =78%
%R_C=0.75

SAMPLE SEMI-DETACHED REAR
TOTAL AREA=1674 m²
IMPERVIOUS AREA=707 m²
PERVIOUS AREA= 802m²
%IMPERVIOUS =48%
%R_C=0.54

SAMPLE SEMI-DETACHED FRONT
TOTAL AREA=1339 m²
IMPERVIOUS AREA=1052 m²
PERVIOUS AREA= 287m²
%IMPERVIOUS =79%
%R_C=0.75

LEGEND

PERVIOUS AREA

SAMPLE AREA



120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

CARDINAL CREEK VILLAGE
PHASE 7
CITY OF OTTAWA

PERVIOUS AREA FIGURE		
SCALE:	1:1000	PROJECT No.: 21-1263
DATE:	JULY 2026	FIGURE: 1

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)															CARDINAL CREEK VILLAGE PHASE 1 STORM DESIGN SHEET																				
Manning		0.013		Return Frequency																															
Location	LOCATION		AREA (Ha)												FLOW						ICD DATA				DESIGN FLOW	SEWER DATA								TIME OF FLOW (min.)	RATIO Q/Q full
	From Node	To Node	R= 0.25	R= 0.40	R= 0.52	R= 0.54	R= 0.70	R= 0.72	R= 0.74	R= 0.80	R= 0.90	Indiv. 2.78 AC	Accum. 2.78 AC	Time of Conc.	Rainfall Intensity	Peak Flow Q (l/s)	No.	Type	Flow Q (l/s)	Accum. Flow	DIA. (mm) (actual)	DIA. (mm) (nominal)	TYPE	SLOPE (%)		LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)							
avenue de la Famille-Laporte Avenue																																			
Contribution from External							5.03					9.79	9.79			660	Additional (100Yr - 5Yr) Flow																		
	1150	115										0.00	9.79	12.00	94.70	1587						1587	1050	1050	CONC	0.40	19.0	1727	1.99	0.16	0.92				
Contribution from EXTERNAL OLD MONTREAL ROAD											0.03	0.08	9.86			13	Additional (10Yr - 5Yr) Flow																		
Contribution from EXTERNAL OLD MONTREAL ROAD											1.74	4.35	14.22			78	Additional (10Yr - 5Yr) Flow																		
Contribution from EXTERNAL OLD MONTREAL ROAD											0.11	0.28	14.49			5	Additional (10Yr - 5Yr) Flow																		
																660	Total Additional (100Yr - 5Yr) Flow																		
																96	Total Additional (10Yr - 5Yr) Flow																		
	115	116						0.54				0.08	1.25	15.74																					
Contribution from EXTERNAL											0.07	0.54	16.29	12.16	94.02	2287						2287	1200	1200	CONC	0.70	49.5	3262	2.88	0.29	0.70				
	116	117										0.28	0.41	16.70																					
Contribution from EXTERNAL - Cont MH												0.70	17.40	12.44	92.84	2371						2371	1200	1200	CONC	0.70	117.5	3262	2.88	0.68	0.73				
Contribution from EXTERNAL - Cont MH												6.42	6.42	13.00	90.63	582						582	750	750	CONC	0.50	16.5	787	1.78	0.15	0.74				
Contribution from EXTERNAL												2.74	2.74	10.00	104.19	286						286	600	600	CONC	0.50	11.5	434	1.54	0.12	0.66				
Contribution from EXTERNAL OLD MONTREAL ROAD												5.97		13.00																					
	117	118									0.68	1.70	1.70			31	Additional (10Yr - 5Yr) Flow																		
	118	119									0.14	0.35	34.59	13.12	90.15	3904						3904	1500	1500	CONC	0.50	58.0	4998	2.83	0.34	0.78				
Contribution from EXTERNAL - Cont MH											0.23	0.58	35.16	13.47	88.87	3911						3911	1500	1500	CONC	0.50	84.0	4998	2.83	0.49	0.78				
												2.67	2.67	10.00	104.19	278						278	600	600	CONC	0.50	12.0	434	1.54	0.13	0.64				
												0.09	37.92																						
												0.20	38.12																						
	119	1190				0.07	0.06				0.19	0.67	38.78	13.96	87.07	4133						4133	1500	1500	CONC	0.50	61.5	4998	2.83	0.36	0.83				
Contribution From rue Mishawashkode Street, Pipe 201 - 1190												0.80		10.75																					
	1190	113									0.02	0.05	39.63	14.32	85.81	4157						4157	1650	1650	CONC	0.49	18.5	6380	2.98	0.10	0.65				
To cote de la Minoterie Ridge , Pipe 113 - 114													39.63	14.43		660	Total Additional (100Yr - 5Yr) Flow																		
																126	Total Additional (10Yr - 5Yr) Flow																		
voie de Brouage Way																																			
	109	105										0.26	0.26																						
To cote de la Minoterie Ridge , Pipe 105 - 106												0.67	0.93	10.00	104.19	97						97	375	375	PVC	2.50	116.5	277	2.51	0.77	0.35				
													0.93	10.77																					
cote de la Minoterie Ridge																																			
												0.06	0.06																						
	100	101				0.09	0.18		0.39			1.18	1.24	10.00	104.19	129						129	300	300	PVC	3.30	91.0	176	2.49	0.61	0.74				
	101	102							0.03			0.06	1.30	10.61	101.08	132						132	375	375	PVC	1.20	12.5	192	1.74	0.12	0.68				
	102	104					0.31	0.19				0.84	2.14	10.73	100.49	215						215	375	375	PVC	3.00	45.0	304	2.75	0.27	0.71				
	104	105						0.12				0.23	2.37	11.00	99.18	235						235	450	450	PVC	1.40	34.0	337	2.12	0.27	0.70				
Contribution From voie de Brouage Way, Pipe 109 - 105												0.93		10.77																					
						0.20						0.29	3.59		104.19	374						374													
	105	106				0.11		0.24				0.63	4.22	11.27	97.93	413						413	600	600	CONC	1.00	67.0	614	2.17	0.51	0.67				
	106	107						0.06				0.12	4.34	11.78	95.63	415						415	675	675	CONC	0.50	16.0	594	1.66	0.16	0.70				
	107	108						0.10				0.19	4.53	11.94	94.93	430						430	825	825	CONC	0.20	23.0	642	1.20	0.32	0.67				
	108	200						0.05				0.10	4.63	12.26	93.58	433						433	825	825	CONC	0.20	15.5	642	1.20	0.22	0.67				
To de l'Astrolabe, Pipe 200 - 202													4.63	12.48																					
Contribution From avenue de la Famille-Laporte Avenue, Pipe 1190 - 113												39.63		14.43		660	Total Additional (100 - 5Yr) Flow																		
Contribution From avenue de la Famille-Laporte Avenue, Pipe 1120 - 113												2.61		11.58		126	Total Additional (10Yr - 5Yr) Flow																		
						0.23						0.33	42.58																						
	113	114				0.13	0.05	0.15	0.07			0.70	43.27	14.43	85.46	4454						4454	1650	1650	CONC	0.49	66.5	6380	2.98	0.37	0.70				
	114	200						0.02				0.04	43.31	14.80	84.22	4403						4403	1650	1650	CONC	0.49	9.0	6380	2.98	0.05	0.69				
To de l'Astrolabe , Pipe 200 - 202													43.31	14.85		660	Total Additional (100 - 5Yr) Flow																		
																126	Total Additional (10Yr - 5Yr) Flow																		
Definitions:																		Designed:				PROJECT:													
Q = 2.78 AIR, where																		K.M.				CARDINAL CREEK VILLAGE - PHASE 1													
Q = Peak Flow in Litres per second (L/s)																						LOCATION:													
A = Areas in hectares (ha)																		Z.L.				City of Ottawa													
I = Rainfall Intensity (mm/h)																		Dwg. Reference:				File Ref:													
R = Runoff Coefficient																		Storm Drainage Plan, Dwg. No. 64 - 68A				11-513B-1													
																						Date:													
																						November, 2014													
																						Sheet No.													
																						2 of 4													

CARDINAL CREEK VILLAGE PHASE 1 STORM DESIGN SHEET
MODIFIED 2026-07-16



468 L/s FROM CCV PH 8
DESIGN SHEETS (JULY 2026)

CARDINAL CREEK VILLAGE PHASE 1 STORM DESIGN SHEET
MODIFIED 2026-07-16

[illegible]

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

CARDINAL CREEK VILLAGE PHASE 4 STORM DESIGN SHEET
MODIFIED 2026-07-16



Manning0.013Return Frequency= 5 years

LOCATION			AREA (Ha)										FLOW					ICD DATA				DESIGN FLOW	SEWER DATA								TIME OF FLOW (min.)	RATIO Q/Q full	
From Node	To Node		R=0.25	R=0.40	R=0.52	R=0.54	R=0.70	R=0.72	R=0.75	R=0.80	R=0.90	Indiv. 2.78 AC	Accum. 2.78 AC	Time of Conc.	Rainfall Intensity	Peak Flow Q (l/s)	No.	Type	Flow Q (l/s)	Accum. Flow	DIA. (mm) (actual)		DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)					
PHASE 4																																	
cercle Tewin Circle																																	
	3063	3062						0.01					0.02	0.02																			
	3062	3061						0.07					0.62	0.64	10.00	104.19	66					66	300	300	PVC	2.00	45.5	137	1.93	0.39	0.48		
													0.00	0.64	10.39	102.17	65					65	300	300	PVC	2.00	44.5	137	1.93	0.38	0.48		
													0.14	0.78																			
													0.53	1.31																			
	3061	3060				0.18	0.05	0.05	0.05				1.26	2.57	10.78	100.27	258					258	450	450	PVC	1.30	65.0	325	2.04	0.53	0.79		
						0.11	0.17	0.23	0.20				0.16	2.73																			
	3060	305						0.18	0.19				0.73	3.46	11.31	97.77	338					338	525	525	CONC	0.90	78.5	408	1.88	0.69	0.83		
To avenue de la Famille-Laporte Avenue , Pipe 305 - 1004																																	
rang de Stadaconé Row																																	
	326	327											0.58	0.58	10.00	104.19	60					60	300	300	PVC	0.60	106.5	75	1.06	1.68	0.80		
	327	324											0.25	0.82	11.68	96.11	79					79	300	300	PVC	1.00	19.0	97	1.37	0.23	0.82		
To voie du Cap-Diamant Way , Pipe 324 - 154																																	
voie du Cap-Diamant Way																																	
													0.09	0.09																			
	2180	218				0.06							1.73	1.82	10.00	104.19	190					190	600	600	CONC	0.20	84.0	275	0.97	1.44	0.69		
To terrasse du Géographe Terrace, Pipe 218 - 219																																	
Contribution From External (Interim OMR)																																	
	321	322			0.24								0.27	0.27			5	Additional (10Yr - 5Yr) Flow															
	322	323											0.62	0.88	10.00	104.19	97					97	375	375	PVC	0.60	118.0	136	1.23	1.60	0.71		
Contribution From External (Interim OMR)																																	
	323	324			0.07								0.00	0.88	11.60	96.44	90					90	375	375	PVC	0.60	14.0	136	1.23	0.19	0.66		
Contribution From External (Interim OMR)																																	
	323	324											0.08	0.96			1	Additional (10Yr - 5Yr) Flow															
	323	324											0.56	1.52	11.79	95.61	151					151	450	450	PVC	0.40	38.0	180	1.13	0.56	0.84		
Contribution From rang de Stadaconé Row, Pipe 327 - 324																																	
Contribution From External (Interim OMR)																																	
					0.42								0.47	2.81			8	Additional (10Yr - 5Yr) Flow															
Contribution From External (Interim)																																	
					0.05								0.06	2.86																			
Contribution From External (Interim)																																	
	324	154			0.08								0.00	2.86			465	100 Yr Pre-development Flow															
	324	154											0.61	3.47	12.35	93.24	804					804	825	825	CONC	0.50	43.5	1015	1.90	0.38	0.79		
To rue du Cartographe Street , Pipe 154 - 328																																	
rue Mishawashkode Street																																	
	223	2210											0.00	0.00	10.00	104.19	0					0	300	300	PVC	0.40	30.5	61	0.87	0.59	0.00		
	2210	221											0.48	0.48	10.59	101.19	49					49	300	300	PVC	0.40	18.0	61	0.87	0.35	0.79		
To terrasse du Géographe Terrace , Pipe 221 - 222																																	
rue du Cartographe Street																																	
	3270	328											0.29	0.29	10.00	104.19	30					30	300	300	PVC	0.50	57.5	68	0.97	0.99	0.44		
To terrasse du Géographe Terrace , Pipe 328 - 220																																	
Contribution From voie du Cap-Diamant Way, Pipe 324 - 154																																	
	154	328											3.47		12.73		480	100 Yr Pre-development Flow + Additional (10Yr - 5Yr) Flows															
	154	328											0.00	3.47	12.73	91.69	798					798	825	825	CONC	1.20	58.5	1572	2.94	0.33	0.51		
To terrasse du Géographe Terrace , Pipe 328 - 220																																	
terrasse du Géographe Terrace																																	
Contribution From rue du Cartographe Street, Pipe 154 - 328																																	
													3.47		13.06		480	100 Yr Pre-development Flow + Additional (10Yr - 5Yr) Flows															
Contribution From rue du Cartographe Street, Pipe 3270 - 328																																	
	328	220											0.29		10.99																		
	220	221											0.25	4.01	13.06	90.39	843					843	825	825	CONC	0.90	23.5	1362	2.55	0.15	0.62		
Contribution From rue Mishawashkode Street, Pipe 2210 - 221																																	
	221	222											0.00	4.01	13.21	89.81	840					840	825	825	CONC	1.00	57.5	1435	2.69	0.36	0.59		
Contribution From rue Mishawashkode Street, Pipe 2210 - 221																																	
	221	222											0.48		10.93																		
	221	222											0.36	4.85	13.57	88.47	909					909	900	900	CONC	0.50	37.5	1280	2.01	0.31	0.71		
Contribution From voie du Cap-Diamant Way, Pipe 2180 - 218																																	
	222	218											0.37	5.22	13.88	87.35	936					936	975	975	CONC	0.35	64.0	1326	1.78	0.60	0.71		
Contribution From voie du Cap-Diamant Way, Pipe 2180 - 218																																	
	218	219				0.13	0.14						1.82		11.44																		
	218	219											1.11	8.15	14.48	85.27	1175					1175	1200	1200	CONC	0.15	80.5	1510	1.34	1.00	0.78		
To avenue de la Famille-Laporte Avenue , Pipe 219 - 1004																																	
Definitions:																																	
Q = 2.78 AIR, where															Notes:																		
Q = Peak Flow in Litres per second (L/s)															1) Ottawa Rainfall-Intensity Curve																		
A = Areas in hectares (ha)															2) Min. Velocity = 0.80 m/sec																		
I = Rainfall Intensity (mm/h)																																	
R = Runoff Coefficient																																	
															Designed:																		
															K.M.																		
															Checked:																		
															W.L.																		
															Dwg. Reference:																		
															Storm Drainage Plan, Dwg. No. 41 & 42																		
															PROJECT:																		
															CARDINAL CREEK VILLAGE - PHASE 4																		
															LOCATION:																		
															City of Ottawa																		
															Dwg. Reference:																		
															Storm Drainage Plan, Dwg. No. 41 & 42																		
															File Ref:																		
															16-864																		
															Date:																		
															November, 2017																		
															Sheet No.																		
															1 of 3																		

ADDED FOR CCV
PH 8 (JULY 2026)

CARDINAL CREEK VILLAGE PHASE 4 STORM DESIGN SHEET
MODIFIED 2026-07-16



Manning	0.013	Return Frequency	= 5 years
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LOCATION		AREA (Ha)										FLOW				ICD DATA				DESIGN FLOW	SEWER DATA							TIME OF FLOW (min.)	RATIO Q/Q full					
		R= 0.25	R= 0.40	R= 0.52	R= 0.54	R= 0.70	R= 0.72	R= 0.75	R= 0.80	R= 0.90	Indiv. 2.78 AC	Accum. 2.78 AC	Time of Conc.	Rainfall Intensity	Peak Flow Q (l/s)	No.	Type	Flow Q (l/s)	Accum. Flow		DIA. (mm) (actual)	DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)							
Location	From Node	To Node																																
avenue de la Famille-Laporte Avenue																																		
Flow From DSEL Design CCV Phase 8 (July 2026)																					468	675	675	CONC	1.60	55.0	1063	2.97	0.31	0.44				
To rue de la Baie-des-Castors Street , Pipe Ex. 143 - Ex. 144																					0.00	12.88					468							
Contribution From External (Interim OMR)																					0.32													
Contribution From Future Phase, Pipe 304 - Plug																																		
													</																					

CARDINAL CREEK VILLAGE PHASE 4 STORM DESIGN SHEET
MODIFIED 2026-07-16

[illegible]

Notes:

- 1) Ottawa Rainfall-Intensity Curve
- 2) Min. Velocity = 0.80 m/sec

Designed: K.M.	PROJECT: CARDINAL CREEK VILLAGE - PHASE 4		
Checked: W.L.	LOCATION: City of Ottawa		
Dwg. Reference: Storm Drainage Plan, Dwg. No. 41 & 42	File Ref: 16-864	Date: November, 2017	Sheet No. 3 of 3

DESIGN BRIEF

FOR

CARDINAL CREEK VILLAGE PHASE 4

TAMARACK (CARDINAL CREEK) CORPORATION

CITY OF OTTAWA

PROJECT NO.: 16-864

**SEPTEMBER 2017
2ND SUBMISSION
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- an order of magnitude greater than the 1.6 L/s estimated loss of baseflow in the North Tributary associated with the development in the *Site Specific Water Budget Report* (PECG, June 2013), which formed part of the *Master Servicing Study* (DSEL, July 2013); and,
- greater than those committed to in May 2014 with the City and RVCA during detailed design of the first phase of Cardinal Creek Village and greater than the commitment to adhere to a minimum base flow calculation of 5.5 L/s, as required in the conditions of draft approval for the subdivision.

Therefore, the proposed Phase 4 stormwater management plan satisfies the previously established requirements to provide baseflow contributions to the North Tributary.

The *Master Servicing Study* (DSEL, July 2013) committed to diverting combined weeping tile and storm flows up to the 2-year design storm event from 10.12 ha of the proposed developed lands to the North Tributary (in addition to drainage within the North Tributary catchment), to compensate for reductions in stream flow due to closing of the portion of the North Tributary upstream of the environmental protection zone and due to drainage catchment diversion and urbanization. However, in *Section 9.6.3 Stream Flow Analysis for Cardinal Creek and the North and South Tributaries*, proposed condition flows in the North Tributary were anticipated to exceed existing flows for frequent events by 0.55 m³/s and 0.01 m³/s in the 2-year and 5-year design storms, respectively. Although the MSS goes on to prove that the exceedance does not impact the level of service of the existing crossings of Cardinal Creek, the MSS did not present an erosion assessment of the North Tributary to confirm that the flow rates were appropriate. Instead the MSS committed that the detailed design of outfalls will be designed to City standards, with attention to erosion issues.

The JFSA 2013 *Baseflows to the North Tributary* memo, which formed part of the DSEL July 2013 *Master Servicing Study*, further explains that in order to not exceed maximum pre-development flow conditions, the flows to the North Tributary will be controlled by an orifice plate and treated with the use of an Oil and Grit Separator before being discharged to the North Tributary, with flows which exceed the capacity of the orifice plate being directed to the stormwater management facility.

Subsequent to the MSS, a detailed stormwater management plan for the subdivision and an erosion assessment were completed for the North Tributary and approved by the City and RVCA as part of Phase 1 of Cardinal Creek Village. The existing and interim flows are summarized below, in comparison to the current proposed flow rates. The erosion assessment suggested that the North Tributary will be in an erosional state in the downstream reaches near the existing Hydro One corridor under all flow conditions (predevelopment conditions, interim development conditions, and ultimate development conditions) because of the bed material and channel slopes, so recommended weirs - among other measures - in the lower reaches of the North Tributary for stabilization. The

recommended treatments have been constructed and accounted for the potential increase in baseflow of 20 L/s from the redirection of residential weeping tile flows. Notwithstanding the fact that the reduction in peak flows due to the proposed development is expected to result in a significant reduction in erosion (expressed in term of effective stream power) in the North Tributary, the erosion assessment recommended monitoring of the North Tributary in the lower reaches post development, since any flows > 1 L/s are expected to continue to cause some natural element of erosion in these specific reaches of the North Tributary. Refer to the *Erosion Hazard Assessment: North Tributary, Cardinal Creek, Ottawa, ON – revision #1.1* (Coldwater Consulting Ltd., dated November 24, 2014) for additional details.

Table 13: Comparison of flows in North Tributary

Return Period (yrs)	Pre-Dev Flows (m ³ /s)	Interim Condition Flows Considered in Erosion Assessment (m ³ /s)	Interim Condition Flows Proposed in Phase 4 Stormwater Mgmt. Plan (m ³ /s)
2	0.55	0.30	0.32
5	1.38	0.83	0.52
10	1.82	1.05	0.69
25	2.38	1.31	0.92
50	2.79	1.48	1.10
100	3.25	1.65	1.42

Therefore, the proposed Phase 4 stormwater management plan satisfies the previously established requirements to provide surface water contributions to the North Tributary. The proposed flows are lower than the reported rates in the MSS because of potential erosion issues.

As shown in the engineering drawings, the OGS system would be placed on the western side of Street No. 6, north of Famille-Laporte Avenue and would discharge to a re-graded ditch conveying water to the North Tributary. In the ultimate condition, this OGS unit will be abandoned and the flows that outlet to the North Tributary will be routed towards an OGS unit at the western side of the Laporte Nursery land.

Table 14: Summary of Existing Storm Sewers

Design Storm Event	Contribution to North Tributary at Eastern Edge of Laporte Nursery
10 mm outflow	124 L/s
25mm outflow	201 L/s
5-year outflow	230 L/s
100-year outflow	252 L/s

Up to the 10 mm storm flows generated from 4.01 ha of the Phase 4 subject lands is proposed to be treated by an oil and grit separator (OGS) to meet MOECC Enhanced Protection Criteria by:

- Capturing and treating at least 90% of the runoff volume that occurs for the site on a long-term average basis [treatment volume efficiency must be calculated without bypass – e.g. for 100% of the total runoff volume for all the storm events that occur for the site on a long-term average basis]; and
- Capturing a minimum of 80% of the annual total suspended solids (TSS) load on a long-term average basis [suspended solids removal efficiency must be calculated based on 100% of the total runoff volume for all the storm events that occur for the site on a long-term average basis].

By way of an MOECC Certificate of Technology Assessment and manufacturer's design report, the OGS unit must prove compliance with the Enhanced quality treatment requirements above, given the specific drainage area parameters below:

- Storm event used to size unit: treatment flow rate equivalent to the 25 mm storm design event (0.201 m³/s) (in accordance with the MOECC SWMP Manual that notes that quality design storm criteria generally range between the 12.5 mm to 25 mm storm design event, and in accordance with the 25mm storm design event flows that are directed to the existing interim pond forebay); and,
- Predicted 100-year design storm peak flows directed to unit by upstream weir: 0.252 m³/s

The manufacturer's reported efficiency of TSS removal for the oil/grit separator is expected to be based on a 'fine distribution' particle size distribution in conformance with **Table 15** below, unless otherwise approved by DSEL, Paterson Group, City of Ottawa, RVCA, and MOECC. The particle size distribution in **Table 15** is the generic particle size distribution accepted by the City of Toronto per the *Wet Weather Flow Management Guidelines* (City of Toronto, 2006) as a typical average stormwater particle size distribution, and is an excerpt from Table 3.3 of the *Stormwater Management Practices Planning and Design Manual* (MOECC, 1994).

Table 15: Typical Stormwater Particle Size Distribution & Settling Velocities (Source: *Stormwater Management Practices Planning and Design Manual*, MOECC, 1994)

Particle Size (microns) (NURP 1983)	% of Particle Mass	Average Settling Velocities (m/s)
< 20	0 - 20	0.00000254
20 - 40	20 - 30	0.00001300
40 - 60	30 - 40	0.00002540
60 - 130	40 - 60	0.00012700
130 - 400	60 - 80	0.00059267

400 - 4000	80 - 100	0.00550333
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Two OGS product examples are included in **Appendix E** as appropriate products to service the subject area, but it is understood that the MOECC, City of Ottawa, and RVCA will allow for an equivalent product to be installed by the Contractor, provided that the system:

- meets the MOECC's criteria for Enhanced Protection;
- ensures no significant negative impact on the upstream storm sewer system – to be determined via hydraulic modelling at detailed design;
- demonstrates suitability for meeting Enhanced water quality targets via a MOECC Certificate of Technology Assessment; and
- meets City of Ottawa requirements for maintenance and operation.

5.2.2 Hydraulic Grade Line Analysis

A hydraulic grade line (HGL) analysis has been completed to ensure that all basements achieve a minimum freeboard of 0.30m between the 100-year storm HGL elevation and the underside of the footing, as per **City Standards**. Please refer to the *Stormwater Management Report for Phase 4 of Cardinal Creek Village* (JFSA, December 2013, Updated September 2017) for additional details, showing that the current Phase 4 design meets all City and MOECC standards and does not negatively impact the overall Cardinal Creek Village minor and major storm systems established in the *Stormwater Management Report for Phase 1 of Cardinal Creek Village* (JFSA, December 2013, Updated May 2014).

The minor system hydraulic gradeline analysis was completed for the proposed system using the DDSWMM and XPSWMM programs based on the 5 and 100-year 3-hour Chicago and 100-year 24-hour SCS design storms, and for the July 1st 1979, August 4th, 1988 and August 8th 1996 historical events. While the analysis determined that the minor stormwater system will surcharge in a large portion of the system, a freeboard of 0.3 m will be maintained between the 100-year HGL and the underside of all footings.

5.3 Major System Conveyance

5.3.1 Major System Design

Per the *Stormwater Management Report for Phase 4 of Cardinal Creek Village* (JFSA, December 2013, Updated September 2017), the Phase 4 contributions to the Phase 1 and 3 overland flow network, Cardinal Creek, and North Tributary flows are generally consistent with the *Stormwater Management Report for Cardinal Creek Village Phase 1* (JFSA, December 2013, Updated May 2014). Additional flows are routed to the existing stormwater management facility, and do not negatively impact the existing stormwater management pond or the overall Cardinal Creek Village minor and major storm systems

established in the *Stormwater Management Report for Phase 1 of Cardinal Creek Village* (JFSA, December 2013, Updated May 2014).

The Phase 4 major systems have been designed according to **City Standards**. A detailed model of static and dynamic ponding is provided in the *Stormwater Management Report for Cardinal Creek Village* (JFSA, December 2013, Updated May 2014) and in the updated *Stormwater Management Report for Phase 4 of Cardinal Creek Village* (JFSA, December 2013, Updated September 2017). The product of the maximum flow depths on streets and maximum flow velocity is less than 0.60 m²/s on all roads.

The major system design is generally consistent with the MSS, except that some drainage boundaries have been refined based on grading refinements completed as part of the Plan of Subdivision design process, previous phases' design process, and new phasing schedule. The MSS allows for minor drainage changes due to the refined land use pattern and refined road network provided that the changes do not appreciably change the net environmental impacts. Based on the detailed assessment provided in the *Functional Servicing Report* (DSEL, September 2013), the *Stormwater Management Report for Cardinal Creek Village Phase 1* (JFSA, December 2013, Updated May 2014), and *Stormwater Management Report for Phase 4 of Cardinal Creek Village* (JFSA, December 2013, Updated September 2017), the stormwater management design is consistent with the overall recommendations and impact assessment contained in the background studies.

5.4 Stormwater Management Conclusions

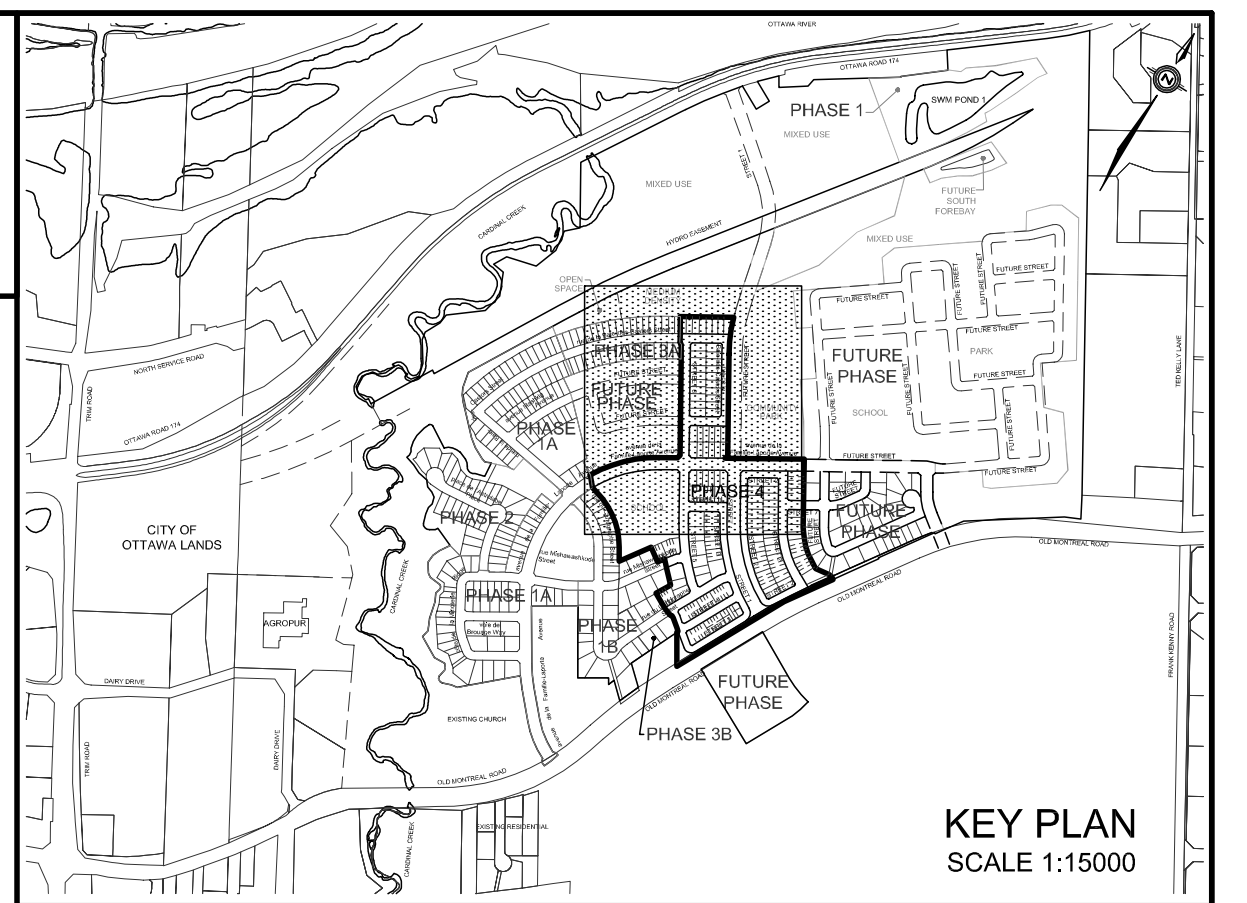
The proposed storm sewers for Phase 4 have been designed in conformance with Ottawa Design Guidelines, MOECC Design Guidelines, the Cardinal Creek Village Phase 1 and Phase 3 design, and the background studies. The sewers have been sized by the Rational Method and inlet control devices (ICDs) are used to restrict the capture rates to protect from unplanned surcharging of the storm sewer network. The underside of footing elevations are designed at a minimum 0.30m above the 100-year storm HGL.

The storm sewers discharge to the existing storm sewers within Phase 1 and Phase 3, a proposed OGS, and a proposed temporary storm outfall channel. Capacity for the Phase 4 lands has been accounted for in the sizing of downstream storm sewer networks and stormwater management facility, per the *Design Brief for Interim Stormwater Management Pond 1 for Phases 1, 2, 3 and 4 in Cardinal Creek Village* (JFSA, December 2013, Updated July 2017) and the *Stormwater Management Report for Phase 4 of Cardinal Creek Village* (JFSA, December 2013, Updated September 2017).

The major overland flows from Phase 4 will be conveyed by public right-of-ways towards Cardinal Creek, the North Tributary, and the existing stormwater management pond. The major system design conforms to Ottawa Design Guidelines and MOECC Design Guidelines.



APPROVED ☐ REFUSED ☐
THIS _____ DAY OF _____, 20____
JEFF MCEWEN, P.ENG
MANAGER, DEVELOPMENT REVIEW - RURAL
PLANNING, INFRASTRUCTURE & ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA



LEGEND

STORM DRAINAGE BOUNDARY	---
SUB-DRAINAGE BOUNDARY	---
UPSTREAM MH TO DOWNSTREAM MH	42-43
AREA IN HECTARES	0.37 0.74
RUNOFF COEFFICIENT	2.78AC=3.09
EXTERNAL 2.78AC =	TC=12.50 MIN
EXTERNAL TIME OF CONCENTRATION	C=0.65 2YR
EXTERNAL BLENDED RUNOFF COEFFICIENT	21-23
EXTERNAL RETURN FREQUENCY CAPTURE	0.28 0.78
UPSTREAM MH TO DOWNSTREAM MH	15
AREA IN OTHER PHASES IN HECTARES	15 MH202
RUNOFF COEFFICIENT	15
STREET CATCHBASIN & LEAD	15
STREET CATCHBASIN WITH	15
CLOSED LID & LEAD	15
MAINTENANCE HOLE	15
CURB INLET CATCHBASIN & LEAD	15
CATCHBASIN/ MAINTENANCE HOLE	15
INTERCONNECTED CATCH BASIN & LEADS	15
CAP	15
OVERLAND FLOW DIRECTION	15
EXTERNAL OVERLAND FLOW DIRECTION	15
OTHER PHASES	15
LIMIT OF HAZARD LANDS	15
6m EROSION ACCESS ALLOWANCE	15
100YR W.L. CARDINAL CREEK	15

TOPOGRAPHIC INFORMATION
TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC GEOMATICS LTD., PROJECT No. 161611900-111
RECEIVED ON JULY 6, 2012 AND PROJECT No. 1616224-111 RECEIVED ON OCTOBER 24, 2013
AND NOVEMBER 29, 2013 AND PROJECT No. 161613473-111 RECEIVED ON MAY 10, 2016

LEGAL INFORMATION
CALCULATED M-PLAN PROVIDED BY STANTEC GEOMATICS LTD., PROJECT No. 161613653-132
RECEIVED ON JUNE 14, 2017. R-PLAN PROVIDED BY STANTEC GEOMATICS LTD., PROJECT No.
161613473-114 DATED JUNE 15, 2016
2nd SUBMISSION 17-09-12

NOT FOR CONSTRUCTION

ELEVATION NOTE
ELEVATIONS HEREON ARE GEODETIC AND ARE DERIVED FROM THE CAN-NET VRS NETWORK.

2.	17-09-12	W.L.	2nd SUBMISSION		
1.	17-07-24	W.L.	1st SUBMISSION		
No.	DATE	BY	DESCRIPTION		BY

Ottawa CITY OF OTTAWA

PROJECT No. 16-864 B1

STORM DRAINAGE PLAN © DSEL

TAMARACK (CARDINAL CREEK) CORPORATION

CARDINAL CREEK VILLAGE PHASE 4

DSEL
david schaeffer engineering ltd

120 Iber Road, Unit 103
Stittville, ON K2S 1E9
Tel: (613) 836-0866
Fax: (613) 836-7183
www.DSEL.ca

DRAWN BY: A.F./A.B. CHECKED BY: C.M./W.L. DRAWING NO. SHEET NO.
DESIGNED BY: C.M./W.L. CHECKED BY: K.M.
SCALE: 1:1000 DATE: JULY 2017

41



STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Manning0.013Return Frequency = 5 years

LOCATION		AREA (Ha)										FLOW					ICD DATA				DESIGN FLOW	SEWER DATA												
From Node	To Node	R=0.25	R=0.40	R=0.52	R=0.64	R=0.70	R=0.72	R=0.74	R=0.80	R=0.90	Indiv. 2.78 AC	Accum. 2.78 AC	Time of Conc.	Rainfall Intensity	Peak Flow Q (l/s)	No.	Type	Flow Q (l/s)	Accum. Flow	DIA. (mm) (actual)		DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME OF FLOW (min.)	RATIO Q/Q full					
avenue de la Famille-Laporte Avenue																																		
2100	210										0.00	0.00	10.00	104.19	0					0	300	300	PVC	1.20	53.5	108	1.50	0.59	0.00					
210	211			0.40	0.08	0.27					1.19	1.19	10.59	101.15	121					121	300	300	PVC	2.90	64.5	165	2.33	0.46	0.73					
211	Ex. 213					0.28					0.54	1.74	11.06	98.93	172					172	375	375	PVC	3.30	52.5	319	2.88	0.30	0.54					
Contribution from Block 109 (School) - Ex. Control MH											4.07	4.07	10.00	104.19	424					424	675	675	CONC	0.50	11.5	594	1.65	0.12	0.71					
	Ex. 213	Ex. 143			0.22						0.29									0.29														
To rue de la Baie-des-Castors Street, Pipe Ex. 143 - Ex. 144											0.69	6.79	11.36	97.52	662					662	675	675	CONC	1.60	55.0	1063	2.97	0.31	0.62					
Contribution From External (Interim OMR)											0.32																							
Contribution From Future Phase, Pipe 304 - Plug											0.36	0.36				6	Additional (10Yr - 5Yr) Flow																	
	Plug	305			0.03	0.05					11.30									11.30														
Contribution From STREET 2, Pipe 3060 - 305											0.12	11.78																						
	305	1004			0.03	0.06					0.13	11.91	13.98	87.02	1043					1043	1200	1200	CONC	0.70	39.0	3262	2.88	0.23	0.32					
	305	1004			0.48		0.07				3.46		12.00																					
To STREET 1, Pipe 1004 - HW (See Note 1 at the end of page)											0.14	15.51																						
	1004				0.16	0.05				0.29	1.83	17.34	14.20	86.23	1501					1501	1200	1200	CONC	0.75	97.0	3376	2.99	0.54	0.44					
Contribution From STREET 5, Pipe 218 - 219											16.98	14.74																						
	219	1004									7.72		15.49		480	100 Yr Pre-development Flow + Additional (10Yr - 5Yr) Flows																		
											0.00	7.72																						
To STREET 1, Pipe 1004 - HW											0.82	8.54	15.49	82.01	1180					1180	1200	1200	CONC	0.15	103.5	1510	1.34	1.29	0.78					
STREET 1											8.54	16.78				480	100 Yr Pre-development Flow + Additional (10Yr - 5Yr) Flows																	
Contribution from Future Phase (Mixed Use Block) - Control MH											2.43																							
Contribution From External											7.10																							
Contribution From External											4.73	4.73	10.00	104.19	844	Additional (100Yr - 5Yr) Flow																		
Contribution From External											4.93	9.66				844	825	825	CONC	0.50	17.5	1015	1.90	0.15	0.83									
Contribution From External (OMR)											4.44	14.10				367	Additional (100Yr - 5Yr) Flow																	
Contribution From External (OMR)											3.30	14.10	10.00	104.19	2518	Additional (100Yr - 5Yr) Flow																		
Contribution From External (OMR)											0.00	14.10				2518	1350	1350	CONC	0.40	27.5	3376	2.36	0.19	0.75									
Contribution From External (OMR)											3.14	7.98	21.98			141	Additional (10Yr - 5Yr) Flow																	
Contribution From External (OMR)											0.23	0.58	22.53			10	Additional (10Yr - 5Yr) Flow																	
1000											1001			0.16																				
1001											1002			0.10	0.11		0.25		0.24	1.41	24.38	10.68	100.75	3656										
1002											1003			0.10	0.19		0.37	1.50	26.08	11.09	98.75	3775												
1003											1004			0.21	0.53	26.60	11.56	98.62	3771															
Contribution From avenue de la Famille-Laporte Avenue, Pipe 219 - 1004											8.54	16.78				480	100 Yr Pre-development Flow + Additional (10Yr - 5Yr) Flows																	
Contribution From avenue de la Famille-Laporte Avenue, Pipe 305 - 1004											16.98	14.74																						
To CHANNEL											0.00	52.13	16.78	78.22	5757					5757	1950	1950	CONC	0.35	25.0	8418	2.82	0.15	0.68					
STREET 6											52.13	16.93				1680	100 Yr Pre-development Flow + Additional (10Yr - 5Yr) Flows																	
Interim Contribution From Street 6											0.08	0.08				20	Foundation Drains Flow to North Tributary																	
219											7050			0.25	0.21		0.77	0.85	10.00	104.19	108													
7050											OGS 1						0.00	0.85	11.12	98.61	104													
OGS 1											HW						0.00	0.85	11.19	98.28	103													
To North Tributary											0.85	11.31																						
Contribution From rue de la Baie-des-Castors Street											0.60	10.83																						
705											709			0.20			0.39	0.99	10.83	100.03	99													
709											Ex. Plug			0.30			0.58	1.58	11.50	98.89	153													
Ex. Plug											Ex. 701						0.00	1.58	11.93	95.00	150													
To rue de la Baie-des-Castors Street, Pipe Ex. 701 - Ex. 702											1.58	12.06																						
Notes:																																		
1 - Contribution to pipe 1004 - HW does not include interim area (0.32Ha) from Old Montreal Road (OMR) as this area is contained within the ultimate OMR contribution to MH 1000 (3.14Ha). Flows from ultimate OMR drain to pipe 1004 - HW through Street 1 storm sewer.																																		
Definitions:																																		
Q = 2.78 AIR, where																																		
Q = Peak Flow in Litres per second (L/s)																																		
A = Areas in hectares (ha)																																		
I = Rainfall Intensity (mm/h)																																		
R = Runoff Coefficient																																		
Notes:																																		
1) Ottawa Rainfall-Intensity Curve																																		
2) Min. Velocity = 0.80 m/sec																																		
Designed:															PROJECT:										CARDINAL CREEK VILLAGE - PHASE 4									
Checked:															LOCATION:										City of Ottawa									
Dwg. Reference:															File Ref:										Date:		Sheet No.							
Storm Drainage Plan, Dwg. No. 41 & 42															16-864										September, 2017		2 of 3							

LICENSED PROFESSIONAL ENGINEER
10017332
SEP 13 2017
PROVINCE OF ONTARIO

PHASE 4 (864)

[illegible]

Designed:	K.M.	PROJECT:	CARDINAL CREEK VILLAGE - PHASE 4		
Checked:	W.L.	LOCATION:	City of Ottawa		
Dwg. Reference:		File Ref:	Date:	Sheet No.	
Storm Drainage Plan, Dwg. No. 41 & 42		16-364	September, 2017	3 of 3	