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Heritage Hills Retail Plaza
471 Terry Fox Drive

Development Servicing and Stormwater Management Report

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HERITAGE HILLS RETAIL PLAZA
471 TERRY FOX DRIVE

DEVELOPMENT SERVICING AND STORMWATER MANAGEMENT REPORT

Prepared by:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

January 25, 2019

Ref: R-2018-158
Novatech File No. 118133

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Engineers, Planners & Landscape Architects

January 25, 2019

City of Ottawa
Planning and Growth Management Department
Infrastructure Approvals Division
110 Laurier Avenue West, 4th Floor
Ottawa, Ontario
K1P 1J1

Attention: Mr. Santhosh Kuruvilla

Dear Sir:

Re: Development Servicing and Stormwater Management Report
Heritage Hills Retail Plaza 471 Terry Fox Drive
Ottawa, Ontario
Our File No.: 118133

Enclosed herein is the 'Development Servicing and Stormwater Management Report' for the proposed development located at 471 Terry Fox Drive, in the City of Ottawa. This report addresses the approach to site servicing and stormwater management for the subject property and is submitted in support of the site plan approval application.

Should you have any questions or require additional information, please contact the undersigned.

Yours truly,

NOVATECH

MSavic

Miroslav Savic, P. Eng.
Project Manager

MS/sm

cc: Dennis Laurin (triMterra Development Corporation)
Gord Erskine (Gord Erskine Architect Inc.)

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

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1.0 INTRODUCTION

Novatech has been retained to complete the site servicing, grading, and stormwater management design for a proposed development at 471 Terry Fox Drive in Kanata (Ottawa), Ontario. The proposed development will consist of a one-storey multi-unit commercial building / retail plaza and a Shell gas station, complete with a car wash and convenience store. The servicing, grading, and stormwater management design for the Shell gas station is being completed by AECOM and submitted with this application under separate cover.

This report outlines the servicing aspects with respect to water, sanitary and storm drainage and addresses the approach to stormwater management for the retail plaza. This report is being submitted in support of the site plan application for the subject property.

1.1 Existing Conditions

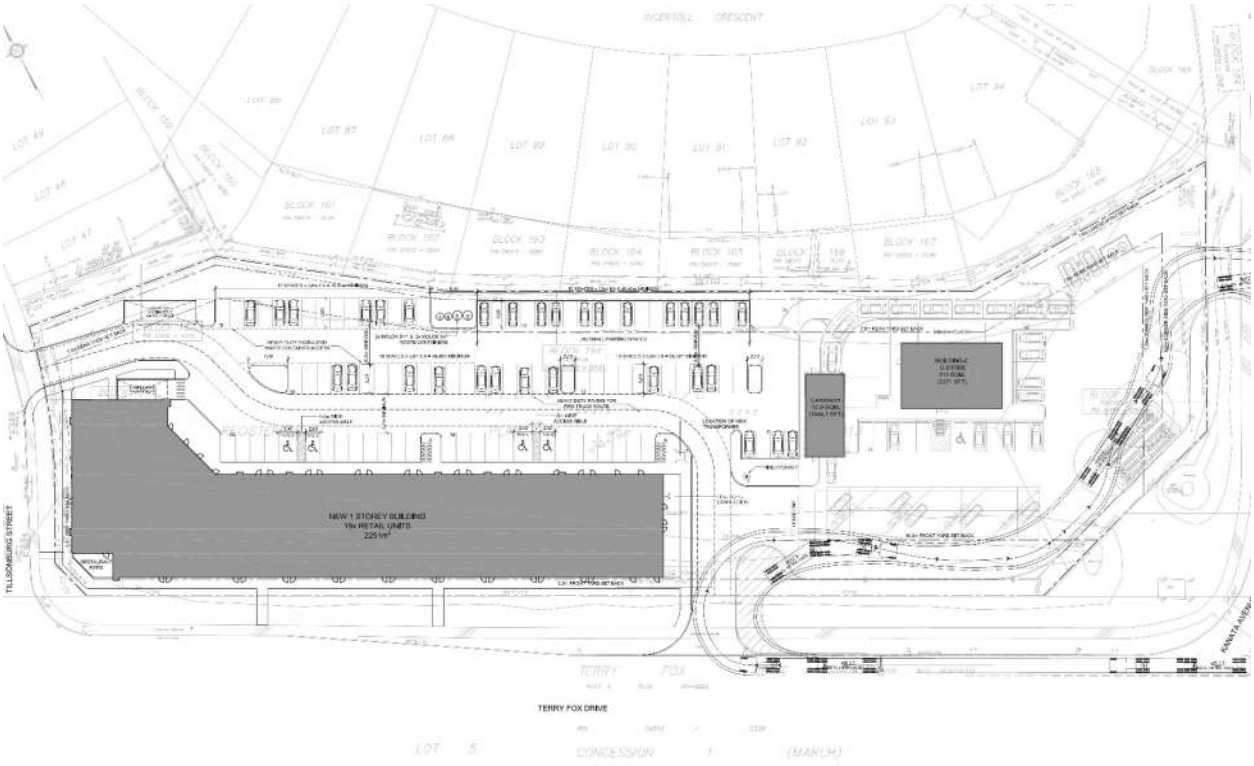
The subject site, shown in **Figure 1**, is a part of the recently constructed Broughton Lands Subdivision. The site is currently vacant and grassed covered.

Figure 1: **Existing Conditions** provides an aerial view of the site.

1.2 Proposed Development

The proposed development consists of a retail plaza, which will include a one-storey multi-unit commercial building and a Shell Gas Bar, complete with a car wash and convenience store (by others). The site will have access points off Kanata Avenue, Terry Fox Drive and Tillsonburg Street. Refer to **Figure 2** for the proposed site plan.

Figure 2: Site Plan



1.3 Consultation and Reference Material

Pre-consultation meetings were held with the City of Ottawa in February 2018 and subsequently in October 2018 at which time the owner was advised of the general submission requirements. Further discussions were held with the City of Ottawa and Mississippi Valley Conservation Authority (MVCA) regarding the approach to stormwater management for the site. The MOECC ECA approval will be required for the proposed Shell gas station. Refer to **Appendix A** for a summary of the e-mail correspondence with the City of Ottawa and MVCA.

The following reference documents were reviewed. Relevant report excerpts are provided in **Appendix B**.

- Geotechnical Investigation Proposed Commercial Development, Terry Fox Drive at Kanata Avenue, prepared by Paterson Group, dated November 7, 2018.
- Broughton Subdivision Phase 1 and 2 Stormwater Management Report (R-2007-129), prepared by Novatech Engineering Consultants Ltd., dated July 21, 2008.
- Broughton Lands Residential Development Phases 1 and 2 Design Brief (R-2007-111), prepared by Novatech Engineering Consultants Ltd, dated July 18, 2008.

2.0 SITE SERVICING

The objective of the site servicing design is to conform to the requirements of the City of Ottawa servicing design guidelines by providing a suitable domestic water supply, proper sewage outlets and ensuring that appropriate fire protection is provided.

The servicing criteria, expected sewage flows and water demands for the site have been established using the City of Ottawa municipal design guidelines for sewer and water distribution. The City of Ottawa Servicing Study Guidelines for Development Applications requires a Development Servicing Study Checklist to confirm that each applicable item is deemed complete and ready for review by City of Ottawa Infrastructure Approvals. A completed checklist is enclosed in **Appendix E** at the back of this report.

2.1 Water Servicing

The proposed development will be serviced by a 200mm dia. water service connecting to the existing 200mm dia. watermain in Tilsonburg Street.

The proposed retail plaza will be sprinklered. The Shell convenience store will not be sprinklered. The fire protection will be provided from a private fire hydrant within the parking lot. The hydrant is located within 45m unobstructed path from the retail building siamese connection location and within 90m from the principal entrances to the Shell convenience store and car wash.

The theoretical water demand for the proposed development, calculated as per the Ottawa Design Guidelines – Water Distribution is summarized in **Table 2.1**. Detailed calculations are enclosed in **Appendix C**.

Table 2.1: Water Demand

Building	Average Day Demand	Maximum Day Demand	Peak Hour Demand
Retail Plaza	0.13 L/s	0.20 L/s	0.35 L/s
Convenience Store	0.07 L/s	0.11	0.20 L/s
Car Wash	-	-	3.41 L/s (54 USGPM)*

*The water demand for the car wash is provided by the car wash supplier.

The Fire Underwriter's Survey (FUS) was used to estimate fire flow demands for the proposed buildings. The calculated fire flow demands are 100.0 L/s (6,000 L/min) and 50 L/s (3,000 L/min) for the retail plaza and the Shell convenience store respectively. Refer to **Appendix C** for detailed calculations.

The hydraulic model EPANET was used for analyzing the performance of the proposed watermain for two theoretical conditions: 1) Maximum Day + Fire Flow Demand and 2) Peak Hour Demand. The model is based on hydraulic boundary conditions provided by the City of Ottawa. Refer to **Appendix A** for email correspondence with the City of Ottawa.

The model indicates that the minimum watermain pressure under the Maximum Day + Fire Flow Demand will be 402.70 kPa (58.41 psi). The minimum watermain pressure under the Peak Hour Demand will be 596.15 kPa (86.46 psi). Refer to **Appendix C** for detailed calculations.

The proposed watermain was checked for high pressure during average day demand, using a maximum HGL of 162.3m as provided by the City of Ottawa. The model indicates pressures above 552 kPa (80 psi) throughout the system, up to a maximum of 646.48 kPa (93.76 psi). Since the maximum pressure exceeds 80 psi, pressure reducing valves will have to be installed in the proposed buildings downstream of the meter as per the City of Ottawa requirements.

Based on the preceding analysis it can be concluded that the existing 200mm watermain in Tilsonburg Street can provide adequate water supply to the proposed development.

2.2 Sanitary Sewer

The proposed development will be serviced by connecting a 200 mm dia. sanitary service to the existing 250mm diameter sanitary sewer in Tilsonburg Street. The proposed 200 mm dia. sanitary service will be a gravity pipe at a minimum slope of 0.5% with a full flow conveyance capacity of 24.2 L/s.

The calculated peak sanitary flow from the site, including infiltration, is 4.04 L/s. The peak flows for the retail plaza and the convenience store have been calculated as per the City of Ottawa Sewer Design Guidelines. The sanitary flow for the car wash included in the calculations equals the maximum water demand provided by the cars wash supplier. Refer to **Appendix C** for detailed calculations. The proposed 200mm diameter sanitary service has sufficient capacity to convey anticipated sanitary flows generated by the proposed development.

The subject site is a part of the recently constructed Broughton Lands Subdivision. Refer to Future Commercial Block on the Broughton Lands – Phase 1 Sanitary Drainage Area Plan (drawing 102118-SAN), provided in **Appendix B**.

The sanitary flows from the Broughton Subdivision is directed towards Signature Ridge Pump Station (SRPS) located at the South West corner of Terry Fox Drive and Kanata Avenue. According to *Broughton Lands Residential Development Phases 1 and 2 Design Brief* (Novatech July 18, 2018), the SRPS has been designed as the outlet for the Broughton Subdivision and adjacent lands. The capacity for all tributary land is either available now or will be made available by future planned upgrades to the pump station.

The sanitary sewer system from Broughton Subdivision is connected to the SRPS via 375mm diameter sanitary sewer along the west side on Terry Fox Drive. Refer to Broughton Lands Subdivision Sanitary Servicing Plan included in **Appendix B**.

The existing sewers are sized allowing 1.66 L/s from the site. As a result of the proposed development the peak sanitary flows from the site will increase by 2.38 L/s. As per the Sanitary Sewer Design Sheet from the Broughton Lands report (included in **Appendix B**) the Tilsonburg Street sewer and the downstream outlet sewers have excess capacity for this additional flow. Therefore, there are no concerns that the proposed development flows will have any adverse impact on the performance of the existing sanitary sewer system.

3.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

The proposed storm drainage and stormwater management design is based on the *City of Ottawa Sewer Design Guidelines* (October 2012) and accompanying technical bulletins. The SWM criteria are governed by the *Broughton Subdivision Phase 1 & 2 Stormwater Management Report* (Novatech, July 2008). Excerpts from this report are provided in **Appendix B**.

3.1 Existing Conditions

Under existing conditions, stormwater runoff drains overland from west to east towards the Kanata Avenue roadside ditch. The Kanata Avenue roadside ditch crosses Terry Fox Drive via a 1200mm dia. storm sewer and outlets into an open channel, which discharges directly into the Carp River.

3.2 Allowable Release Rate

The site is a part of the recently constructed Broughton Lands Subdivision; refer to Future Commercial Block 170 on the Broughton Lands – Phase 1 Storm Drainage Area Plan (drawing 102118-SWM), provided in **Appendix B**.

The development of the storm sewer on Tillsonburg Street and Carp River stormwater management facility accounted for the future development of Commercial Block 170; with an assumed runoff coefficient of 0.75 for the 1.20 ha area.

Due to grading constraints, the entire Commercial Block 170 cannot be serviced by the storm sewer on Tillsonburg Street. As such, drainage for the site has been divided so that the Retail Plaza will outlet to the Tillsonburg Street storm sewer and the Shell Gas Bar will outlet into the Kanata Avenue Roadside Ditch.

A 0.114 ha area from the Retail Plaza will drain to the Shell Gas Bar, which will have on-site stormwater management (by others). A summary of drainage areas is shown in **Table 3.1**.

Table 3.1: Summary of Drainage Areas

Outlet	Retail Plaza	Shell Gas Bar	TOTAL
Tillsonburg Street Storm Sewer	0.653	-	**0.653**
Kanata Avenue Roadside Ditch	0.114	0.413	**0.527**
TOTAL	**0.767**	**0.413**	**1.180**

3.2.1 Tillsonburg Street Storm Sewer

The allowable release rate to the Tillsonburg Street storm sewer was calculated using the Rational Method based on the following parameters:

The allowable release rate is based on the proposed 0.653 ha drainage area to the Tillsonburg Street storm sewer. The future Commercial Block 170 was allocated a 0.75 runoff coefficient; refer to the Broughton Subdivision Phase 1 – Storm Sewer Design Sheet (MH200 – MH198), provided in **Appendix B**. The allowable release rate was calculated as follows:

0.653	ha	Drainage Area	*(to Tillsonburg Street Storm Sewer)*
0.75		Runoff Coefficient	*(Allocated for Future Commercial Block 170)*
104.19	mm/hr	Rainfall Intensity	*(5-year Return Period; 10-minute Time-of-Concentration)*
141.9	L/s	Allowable Release Rate	*(2.78 x 0.653 ha x 0.75 x 104.19 mm/hr)*

An allowable release rate of 141.9 L/s will need to be maintained to the Tillsonburg Street storm sewer for all storms up-to and including the 100-year storm event.

3.3 Stormwater Management Criteria

The stormwater management criteria for stormwater quantity and quantity control of the proposed development of the Retail Plaza was established based on discussions with the City of Ottawa and Mississippi Valley Conservation Authority (MVCA). Refer to correspondence provided in **Appendix A**.

3.3.1 Stormwater Quantity Control

Stormwater quantity control will need to be provided to control 100-year post-development peak flows to the allowable release rate for the Tilsonburg Street Storm Sewer (141.9 L/s).

As per the City of Ottawa Sewer Design Guidelines (October 2012), there is to be no surface ponding during a 2-year storm event. In addition, surface ponding depths cannot exceed 0.30m.

An emergency overland flow route is to be provided for storm events greater than the 100-year event.

3.3.2 Stormwater Quality Control

An enhanced level of stormwater quality control, corresponding to 80% long-term TSS removal, for the Tillsonburg Street storm sewer is provided within the Carp River SWM Facility.

The proposed imperviousness of the area draining to the Tillsonburg Street storm sewer has increased since the design of the Carp River SWM Facility; however, the drainage area has decreased. A comparison of the Area x Runoff Coefficient (A x C) values is shown in **Table 3.2**.

Table 3.2: Comparison of Water Quality Parameters to Carp River SWM Facility

Scenario	Drainage Area (ha)	Runoff Coefficient	A x C
Allocated (Broughton Ph 1)	1.200	0.75	0.90
Proposed (Retail Plaza)	0.653	0.83	0.54
Difference	- 0.547	0.08	- 0.36

The proposed A x C are less than those previous allocated. In addition, peak flows will be maintained. As such, there will be no anticipated increase in runoff to the SWM Facility.

3.3.3 Stormwater Quantity Control

Stormwater management will be provided using a combination of rooftop storage and surface storage. A brief description of the quantity control strategies for each catchment area is provided below.

Area A-0 (0.064 ha)

Storm runoff from Area A-0 will be uncontrolled and will flow overland to the existing Terry Fox Drive roadside ditch.

Areas A-1, A-2, & A-3 (0.363 ha)

Storm runoff from Areas A-1, A-2, & A-3 (entrance lane / parking lot) will be directed into the proposed on-site storm sewers. Outflows from these areas will be controlled using an ICD within each catchbasin. Storage will be provided by ponding stormwater on the surface. Ponding depths range from 0.20m to 0.23m. The stage-storage curve for each area is provided in **Appendix D**.

Area R-1 (0.226 ha)

Storm runoff from Area R-1 (building roof) will be controlled using nine (9) flow control roof drains and one (1) uncontrolled roof drain for the canopy. Flows from the building roof will restrict outflows from the building roof to 12.6 L/s. The building roof will provide a total storage volume of approximately 99.9 m^3 at a maximum ponding depth of 0.15m.

The rooftop storage and roof drain sizing calculations were completed using the Modified Rational Method. The stage-storage curves and supporting calculations are provided in **Appendix D**. The results of this analysis are summarized in **Table 3.3**.

Table 3.3: Roof Drain Opening Setting and Maximum Release Rates for Each Roof Drain

Roof Drain ID	Catchment Area (ha)	Roof Drain Opening Setting[1]	Modified Rational Method (100yr)		Maximum Release Rate[2] (L/s)	Maximum Storage[2] (m^3)
			Release Rate (L/s)	Storage Used (m^3)		
RD-1	0.017	½ Exposed	1.10	5.9	1.26	9.1
RD-2	0.010	½ Exposed	0.95	2.9	1.26	7.7
RD-3	0.017	½ Exposed	1.10	5.9	1.26	9.1
RD-4	0.019	½ Exposed	1.10	6.7	1.26	9.7
RD-5	0.033	¾ Exposed	1.58	12.9	1.58	13.2
RD-6	0.034	¾ Exposed	1.58	13.2	1.58	13.3
RD-7	0.034	¾ Exposed	1.58	13.2	1.58	13.3
RD-8	0.034	¾ Exposed	1.58	13.2	1.58	13.3
RD-9	0.026	½ Exposed	1.26	10.1	1.26	11.2
RD-10	0.002	-	0.79	-	0.79	-
-	**0.226**	**-**	**12.62**	**85.1**	**13.41**	**99.9**

Notes:

1) *Watts Adjustable Accutrol Control Roof Drain RD-100-A-ADJ.*
2) *Assumes 0.15 m of head.*

3.4 Stormwater Management Modeling

The proposed storm drainage and stormwater management strategy was modelled using the PCSWMM hydrologic / hydraulic model. The PCSWMM model schematic and 100-year output data is provided in **Appendix D**. The PCSWMM Model files are provided on the enclosed CD.

3.4.1 Design Storms

The hydrologic / hydraulic analysis was completed using the 4-hour Chicago synthetic design storm for the 2, 5, and 100-year return periods. The IDF parameters used to generate the design storms were taken from the City of Ottawa Sewer Design Guidelines. The 4-hour Chicago storm distribution is applicable for urban storm drainage systems.

The proposed drainage system has also been stress tested using a 4-hour Chicago design storm that has a 20% higher intensity and total volume compared to the 100-year event.

3.4.2 Storm Drainage Areas

The site has been subdivided into catchment areas representing post-development conditions, based on the proposed grading design and building layout. The runoff coefficients for each catchment were calculated for the proposed conditions. Refer to the Stormwater Management Plan (drawing 118133-SWM) and storm sewer design sheet (provided in **Appendix D**).

3.4.3 Boundary Conditions

The hydrologic / hydraulic analysis assumed downstream boundary conditions that represents a 'normal' or 'fixed' outfall condition within the Tilsonburg Street storm sewer (MH-202). Refer to **Table 3.4** for the downstream boundary conditions for each SWM modeling scenario.

Table 3.4: Downstream Boundary Conditions for SWM Model Scenarios

Return Period	Scenario	Outfall Condition	Fixed Outfall Elevation (m)
2-year	Review Ponding Depth	'Normal' Outfall	-
5-year	Review Ponding Depth	'Fixed' outfall condition representing obvert of D/S connecting pipe (MH-202)	95.28
100-year	Review Release Rate	'Fixed' outfall condition representing obvert of D/S connecting pipe (MH-202)	95.28
	Review Ponding Depth	'Fixed' outfall condition representing 100-year HGL of D/S connecting pipe (MH-202)	96.14

The model was run by first saving then using a hotstart file with initial water depths applied to each node for model stability.

Refer to the Broughton Subdivision Phase 1 – HGL Sewer Design Sheet (MH-202), provided in **Appendix B**.

3.4.4 Model Results

Table 3.5 summarizes the results of the hydrologic / hydraulic analysis for the 100-year storm event. For modeling purposes, the four sub-areas comprising the building roof are represented by a single catchment and stage-storage-discharge rating curves.

Table 3.5: Post-Development Model Results (100yr, 4hr Chicago Event)

Area ID	Area (ha)	Description	ICD Type	Peak Flow[(1)] (L/s)	Storage Required[(2)] (m^3)	Storage Provided (m^3)
A-0	0.064	Uncontrolled to Terry Fox Drive	None	30.3	-	-
A-1	0.054	Entrance Area	IPEX Tempest LMF	8.6	12.3	12.3
A-2	0.167	Parking Lot Area	IPEX Tempest MHF	36.7	30.2	30.2
A-3	0.142	Parking Lot Area	IPEX Tempest MHF	55.4	22.5	22.5
R-1	0.226	Rooftop Storage	Watts Accutrol Drain RD-100-A-ADJ (x9)	12.6	85.1	99.9
TOTAL (minor system)	**0.589**	**-**	**-**	**110.4**	**150.1**	**164.9**
TOTAL (overall)	**0.653**	**-**	**-**	**140.7**	**150.1**	**164.9**

[(1)]Peak flows are based on a 'fixed' outfall condition representing pipe obvert (MH-202) = 95.28m.
[(2)]Storage required is based on a 'fixed' outfall condition representing 100-year HGL = 96.14m.

3.4.5 Ponding Depths and Storage Volumes

Approximately 73.8m^3 of surface storage has been provided in areas A-1, A-2, & A-3 (Entrance / Parking Lot) at maximum depths ranging from 0.20m to 0.23m. There is no ponding on the parking lot surface during frequent (i.e. 2-year) storm events. Runoff from larger storm events will begin to pond on the parking lot surface, but will not exceed the maximum available ponding depths. Other than the uncontrolled area (Area A-0), there is no major system flows offsite during the 100-year event.

The 5-year and 100-year storage volumes and ponding depths for the various storage areas are shown on the Stormwater Management Plan (118133-SWM).

3.4.6 ICD Sizing

The proposed ICD sizes are listed in **Table 3.5** and shown on the General Plan of Services (118133-GP) and the Stormwater Management Plan (118133-SWM). The Tempest LMF & MHF ICD rating curves and supporting documentation are provided in **Appendix D**.

3.4.7 Hydraulic Grade Line

The site is located near the lower end of the sewershed. The *Broughton Subdivision Phase 1 & 2 Stormwater Management Report* (Novatech, July 2008) governs the allowable release rates for the site and the other upstream properties. The existing 975mm storm sewer at the outlet from the site surcharges 0.86m during the 100-year storm event. The 100-year HGL elevations in the existing storm sewer was accounted for in the design.

Check Valve

A check valve will be installed on the 200mm building service lateral to provide additional protection should the storm sewer surcharge.

3.5 SWM Maintenance and Monitoring

It is recommended that the client implement a maintenance and monitoring program for the on-site storm sewers and catchbasins: The storm drainage system should be inspected routinely (at least annually); the ICDs should be inspected to ensure they are fitted securely and free of debris.

4.0 SITE GRADING

The existing site is currently overlain with grasses and is relatively flat sloping gently towards the Kanata Avenue Roadside Ditch. The intent of the grading design was to propose the building finished floor elevation to best tie into the elevations along the existing adjacent roadway and surrounding property lines. The proposed grading design provides positive drainage away from the building and towards the on-site stormwater drainage structures. In the event of a rainfall event exceeding the 100-year storm event, stormwater runoff will cascade over the high points towards the entrance off Terry Fox Drive. Refer to the enclosed Grading and Erosion & Sediment Control Plan (118133-GR) for details.

4.1 Major System Overflow Route

A major system overland flow route is provided to Terry Fox Drive. This is for storm events that exceed the 100-year return period.

Stormwater within the catchbasins located within the entrance / parking lot will pond before overflowing. Each subcatchment will overflow to a lower sub-catchment drainage area and ultimately overflow towards Terry Fox Drive.

Stormwater from the proposed building roof will pond to a maximum of 0.15 m on the rooftops. Overflow scuppers will be provided along the perimeter of the roof. Rooftop drainage will overflow towards the parking lot or towards the landscaped areas; ultimately towards Terry Fox Drive. The minimum building elevations have been set at least 0.30 m above the maximum on-site ponding elevations for protection from flooding.

The major system overflow route is shown on the enclosed Grading Plan (118133-GR) and the Stormwater Management Plan (118133-SWM).

4.2 Erosion and Sediment Control

Erosion and sediment control measures will be implemented during construction in accordance with the "Guidelines on Erosion and Sediment Control for Urban Construction Sites" (Government of Ontario, May 1987). Details are provided on the Grading and Erosion & Sediment Control Plan (113023-GR).

- All erosion and sediment control measures are to be installed to the satisfaction of the engineer, the municipality and the conservation authority prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and remain present during all phases of site preparation and construction.
- A qualified inspector should conduct daily visits during construction to ensure that the contractor is working in accord with the design drawings and that mitigation measures are being implemented as specified.
    - A light duty silt fence is to be installed as per OPSS 577 and OPSD 219.110 along the surrounding construction limits.
    - Catchbasin inserts are to be placed under the grates of all proposed and existing catchbasins and catchbasin manhole drainage structures.
    - Street sweeping and cleaning will be performed, as required, to suppress dust and to provide safe and clean roadways adjacent to the construction site.
    - After complete build-out, all sewers are to be inspected and cleaned and all sediment and construction fencing is to be removed.
- The contractor shall immediately report to the engineer or inspector any accidental discharges of sediment material into any ditch or sewer system. Appropriate response measures shall be carried out by the contractor without delay.

The proposed temporary erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of all erosion control measures is to be undertaken.

5.0 GEOTECHNICAL INVESTIGATIONS

A Geotechnical Investigation Report has been prepared for the proposed site. Refer to the Paterson Group 'Geotechnical Investigation' (Report. No. PG4564-1), dated November 7, 2018 for the existing subsurface conditions, construction recommendations and geotechnical inspection requirements for the proposed development.

6.0 SUMMARY AND CONCLUSIONS

This report has been prepared in support of the site plan application for the proposed development of a Retail Plaza, located at 471 Terry Fox Drive, in the City of Ottawa.

The conclusions are as follows:

- The proposed development will be serviced by connecting to the existing municipal sanitary and storm sewer systems and the existing municipal watermain within the Tillsonburg Street Right-Of-Way.
- The proposed retail plaza will be sprinklered. The Shell gas station will not be sprinklered. The fire protection will be provided by a single fire hydrant located within 45m form the retail building Siamese connection location and within 90m unobstructed path from the principal entrance to the Shell convenience store.
- Stormwater runoff from the site will consist of a combination of controlled parking lot flows and controlled building roof flow. On-site stormwater quantity control will be achieved using inlet control devices located within the on-site catchbasins.
- The total post-development flow from the 0.653 ha area to the Tillsonburg Street storm sewer will be controlled to a maximum of 140.7 L/s during the 100-year design event. The maximum allowable release rate is 141.9 L/s, as calculated to meet the City of Ottawa stormwater quantity requirements.
- On-site water quality treatment is not required as water quality treatment is provided by the Carp River SWM Facility.
- Regular inspection and maintenance of the storm sewer system, including the inlet control devices (ICD's), is recommended to ensure that the storm drainage system is kept clean and operational.
- Temporary erosion and sediment controls are to be provided during construction.

7.0 CLOSURE

This report has been prepared in support of the site plan application for the proposed development of a Retail Plaza located at 471 Terry Fox Drive, in the City of Ottawa.

Servicing assessments discussed in the preceding sections show that there are no major obstacles to servicing the proposed development. It is recommended that the proposed site servicing and stormwater management design be approved for implementation.

NOVATECH

Development Servicing
Prepared by:

Miroslav Savic, P. Eng.
Senior Project Manager | Land Development Engineering

Stormwater Management
Prepared by:

Conrad Stang, M.A.Sc., P.Eng.
Project Manager | Water Resources

APPENDIX A

Correspondence

File Number: D07-01-18-0047
February 13, 2018

471 Terry Fox Drive Pre-Consultation Meeting Minutes
Date: Tuesday, February 13, 2018, 1:30pm to 3:00pm
Location: Room 4161E City Hall

Attendees:

Victoria Bissonnette, Planner, City of Ottawa
Rosanna Baggs, Transportation Project Manager, City of Ottawa
Santhosh Kuruvilla, Project Manager, City of Ottawa
Justin Marr, Planning Assistant, City of Ottawa
Dennis Laurin, Developer
Gord Erskine, Architect, Gord Erskine Architect Inc.

Comments from Applicant:

1. The proposal is for a one-storey multi-unit commercial building as well as a gas bar (Shell) with a car wash and a convenience store.
2. The applicant may propose a drive-through as part of the multi-unit commercial building.
3. The design and layout of the site will be dependent on the drive-through.
4. Access into the site is proposed from Kanata Avenue, Terry Fox Drive and Tilsonburg Street.
5. Roadway modifications will be required as part of this development.

Comments from City Staff

Planning

1. This application is for Site Plan Control with public consultation and will be manager approved. Please see the City's website for details on applicable timelines and fees.
2. Please clearly indicate if the lands will go to the Committee of Adjustment for a severance prior to site plan approval. Note that if the applicant chooses to sever at this time, the lands will have to go through separate site plan approval processes. The City will not comment at this time on the likelihood of obtaining approval for a severance in the future.
3. Please note that there is a 30cm reserve on the subject lands. Once approval is granted for the Site Plan Control application, an application to lift the 30cm reserve will be required.
4. Please ensure to consult the Zoning By-law as a whole to ensure compliance to applicable policies and provisions.

5. Cash-in-Lieu of parkland is to be determined and will be provided by the City Planner. Please consult the Parkland Dedication By-law for standard requirements.
6. The applicant is encouraged to consult the Ward Councillor about the subject proposal, prior to application submission.
7. Staff have the right to further comment once a formal application is submitted, as the pre-consultation meetings are high level.
8. Please note that these comments as well as the list of required plans and studies will lapse in year one from the pre-consultation meeting.

Urban Design

1. Please provide trees along the front of the property. A landscape buffer of coniferous trees is suggested to screen the subject site from adjacent residential and commercial areas.
2. The alternative design created by Mark Young that solves the cutthroat issue and will be attached to this document.
3. Please follow the Urban Design guidelines for a gas station as they should be consulted.

Transportation

1. Follow the new Transportation Impact Assessment (TIA) guidelines for this development.
2. Refer to the Transportation Association of Canada (TAC) for clear throat requirements from collector and arterial roads.
3. A Road Modification Plan will be required if a right turn auxiliary lane is proposed.
4. Ensure that the property lines reflect the 44.5 meter ROW protection on Terry Fox Drive.
5. Show all the road detail of all surrounding streets, including pavement markings.
6. A Stationary Noise Impact Assessment will be required for the carwash, vacuums and for any exposed mechanical equipment on any building within the development.
7. Noise walls in the rear will be ineffective as a method for noise mitigation for this site due to the grading of the site.
8. Please show the turning movements throughout the site for the largest vehicles.
9. Median breaks along Terry Fox Drive that encourage uncontrolled full movement access will not be supported by the City.
10. Please adhere to the new accessibility guidelines.

Engineering

1. The proposal of a gas station/carwash will require MOECC ECA

2. Please refer to the Broughton Lands Serviceability Study (Subdivision File No. D07-16-04-0020) that will provide the stormwater management criteria for this site plan. The report can be requested at the City of Ottawa's Information Centre.
3. For additional information regarding the engineering aspects of the site, please contact Santhosh Kuruvilla by phone at 613-580-2424 ext. 27599 or email Santhosh.Kuruvilla@ottawa.ca.
4. Contact the MCVA for stormwater treatment requirements. Oil & Grit separator may be required.

Please contact me at Victoria.Bissonnette@ottawa.ca or at 613-580-2424 ext. 27029 should you have any questions.

Sincerely,

Victoria Bissonnette
Planner I
Development Review - West

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend: **S** indicates that the study or plan is required with application submission.
A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

For information and guidance on preparing required studies and plans refer to:

http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans

S/A	Number of copies	ENGINEERING		S/A	Number of copies
S	15	1. Site Servicing Plan	2. Site Servicing Study / Brief	S	6
S	6	3. Grade Control and Drainage Plan	4. Geotechnical Study	S	4
	2	5. Composite Utility Plan	6. Groundwater Impact Study		6
	5	7. Servicing Options Report	8. Wellhead Protection Study		6
S	9	9. Transportation Impact Study	10. Erosion and Sediment Control Plan	S	6
	6	11. Storm water Management Report / Brief	12. Hydro geological and Terrain Analysis		8
	3	13. Hydraulic Water main Analysis	14. Noise / Vibration Study	S	3
S	10	15. Roadway Modification Design Plan	16. Confederation Line Proximity Study		9

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
	50	17. Draft Plan of Subdivision	18. Plan Showing Layout of Parking Garage		2
	30	19. Draft Plan of Condominium	20. Planning Rationale	S	3
S	15	21. Site Plan	22. Minimum Distance Separation (MDS)		3
	20	23. Concept Plan Showing Proposed Land Uses and Landscaping	24. Agrology and Soil Capability Study		5
	3	25. Concept Plan Showing Ultimate Use of Land	26. Cultural Heritage Impact Statement		3
S	10	27. Landscape Plan	28. Archaeological Resource Assessment	S	3
S	2	29. Survey Plan	30. Shadow Analysis		3
S	3	31. Architectural Building Elevation Drawings (dimensioned)	32. Design Brief (includes the Design Review Panel Submission Requirements)		Available online
	6	33. Wind Analysis			

S/A	Number of copies	ENVIRONMENTAL		S/A	Number of copies
S	5	34. Phase 1 Environmental Site Assessment	35. Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		6
	5	36. Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	37. Assessment of Landform Features		7
	4	38. Record of Site Condition	39. Mineral Resource Impact Assessment		4
A	10	40. Tree Conservation Report	41. Environmental Impact Statement / Impact Assessment of Endangered Species		11
	4	42. Mine Hazard Study / Abandoned Pit or Quarry Study	43. Integrated Environmental Review (Draft, as part of Planning Rationale)		3

S/A	Number of copies	ADDITIONAL REQUIREMENTS		S/A	Number of copies
S		44. Site Lighting Plan and Certificate	45. PDF Copy of all required plans and studies via CD, USB or email	**S**	

Meeting Date: February 13, 2018

Application Type: *Site Plan Control, Manager Approved*

File Lead (Assigned Planner): Victoria Bissonnette

Infrastructure Approvals Project Manager: Santhosh Kuruvilla

Site Address (Municipal Address): 471 Terry Fox Drive

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, the Planning, Infrastructure and Economic Development Department *will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the* Planning, Infrastructure and Economic Development Department.

Miro Savic

From: Niall Oddie <NOddie@mvc.on.ca>
Sent: Friday, December 07, 2018 11:46 AM
To: Miro Savic
Subject: FW: Heritage Hills Retail Plaza - Water Quality Requirements

Miro,

Please see below.

Niall Oddie MCIP, RPP | Environmental Planner | Mississippi Valley Conservation Authority
10970 Highway 7, Carleton Place, Ontario K7C 3P1
www.mvc.on.ca |t. 613 253 0006 ext. 229| f. 613 253 0122 | noddie@mvc.on.ca

---

From: Sobha Kunjikutty
Sent: Friday, December 7, 2018 8:56 AM
To: Niall Oddie <NOddie@mvc.on.ca>
Subject: RE: Heritage Hills Retail Plaza - Water Quality Requirements

Hi Niall,
We recommend a Normal Level of treatment for water quality for this site. However, the plan should include and demonstrate measures in treating all the runoff from this industrial area on site (e.g stormwater interceptors such as oil/grit).
Let me know if you have any questions.
Thanks,
Sobha

From: Miro Savic [mailto:m.savic@novatech-eng.com]
Sent: Monday, December 3, 2018 4:07 PM
To: Niall Oddie <NOddie@mvc.on.ca>
Cc: Lee Sheets <l.sheets@novatech-eng.com>
Subject: Heritage Hills Retail Plaza - Water Quality Requirements

Good afternoon Niall,

We are working on a commercial development located at 471 Terry Fox Drive. The development proposal is to construct two one-storey multi-unit commercial buildings as well as a Shell gas bar with a car wash and a convenience store. See the attached site plan for detailes.

The storm runoff from the retail plaza portion of the site (Building 1 and Building 2 with the parking lot) will outlet into the existing municipal storm sewer in Tilsonburg Street. The Tilsonburg storm sewer has a flow splitter to direct runoff from storms up to the 25mm event (water quality) to the existing SWM facility of the west side of terry Fox drive. Therefore, the on-site water quality is not required for this portion of the site.

The storm runoff from the Shell gas station will outlet into the existing 1200mm diameter storm sewer near the intersection of Kanata Avenue and Terry Fox Drive. This storm sewer outlets into the ditch which outlets directly into Carp River bypassing the SWM pond (refer to the attached aerial photo). Could you please confirm the water quality requirements for the Shell portion of the site.

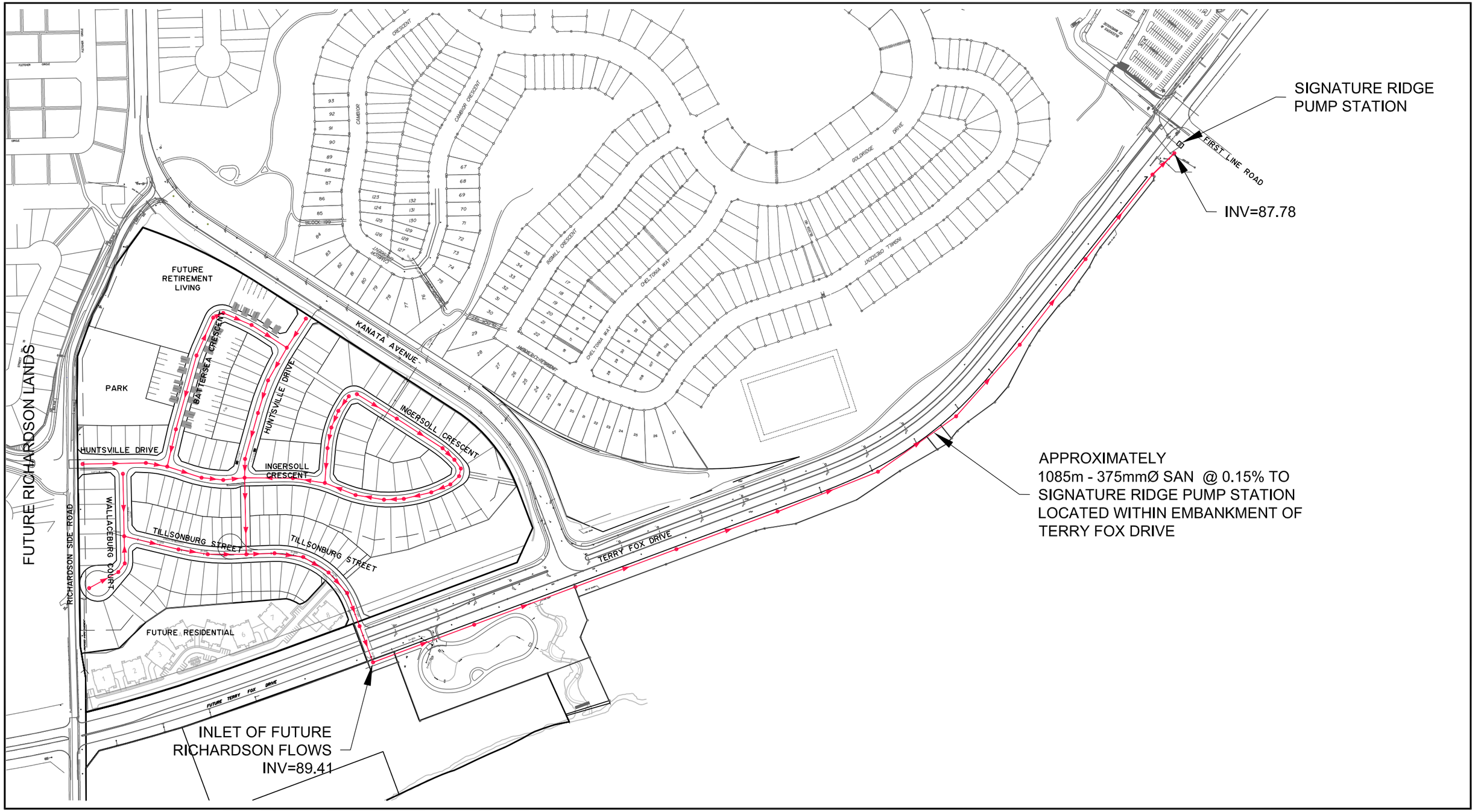
Please contact me should you have any questions.

Regards,

Miroslav Savic, P.Eng., Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 265 | Fax: 613.254.5867

APPENDIX B

Background Report Excerpts



NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

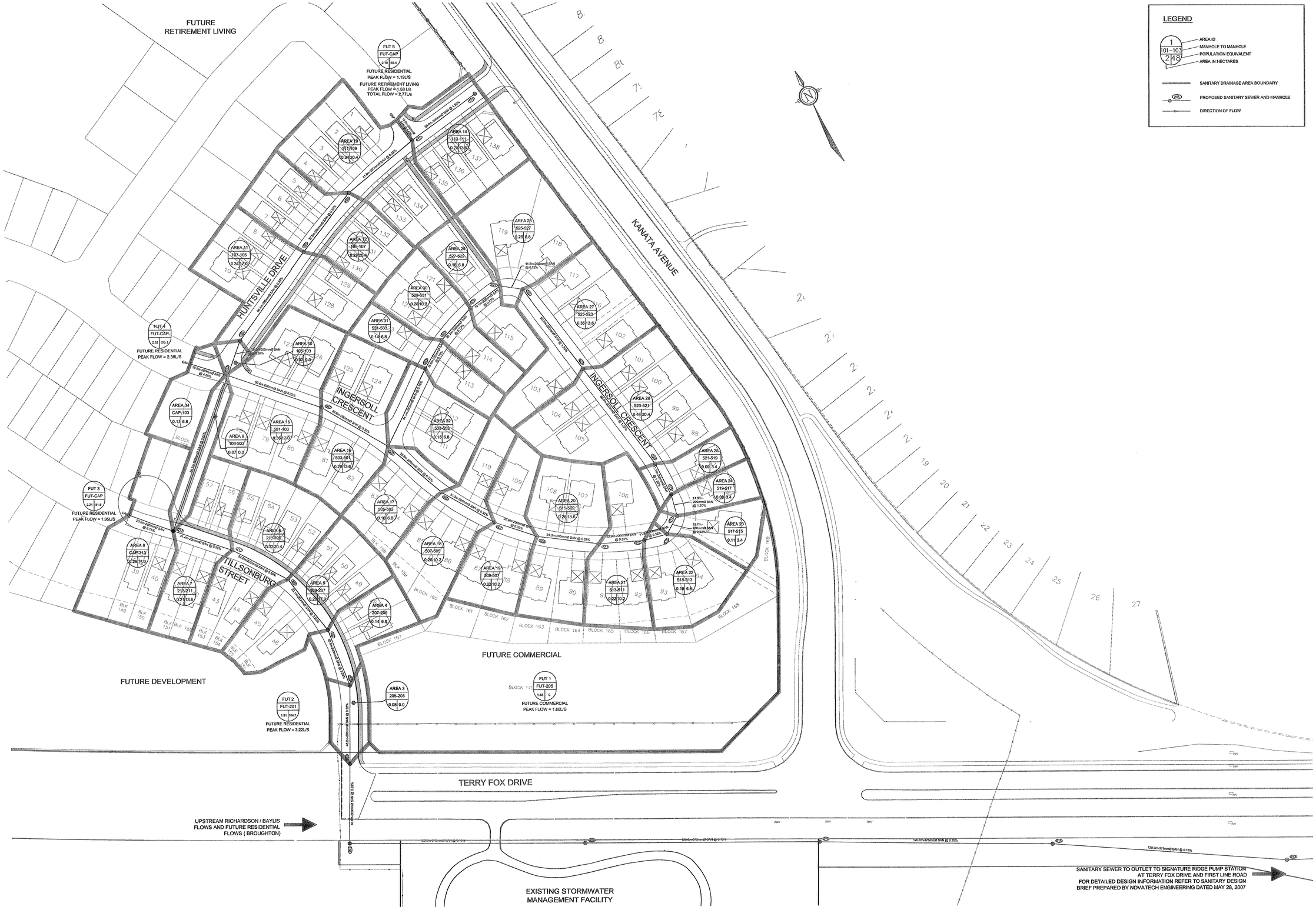
N.T.S.

BROUGHTON LANDS SUBDIVISION

SANITARY SERVICING PLAN

102118 JULY 2008 FIGURE 4

SHTIIX17.DWG - 278mmX431mm



NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
7	ISSUED FOR MOE APPROVAL	JULY 18/08	MSP
6	REVISED AS PER CITY COMMENTS	JUN 20/08	MSP
5	REVISED AS PER CITY COMMENTS	APR 29/08	MSP
4	REVISED AS PER CITY COMMENTS	DEC 14/07	MSP
3	REVISED LOT LAYOUT	AUG 24/07	MSP
2	ISSUEDFOR CITY REVIEW	JULY 16/07	MSP
1	ISSUED WITH SANITARY DESIGN BRIEF	MAY 28/07	MER

REGISTERED PROFESSIONAL ENGINEER
J.G. RIDDELL
PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email novainfo@novatech-eng.com

DESIGN	ATR/JA
CHECKED	MSP/MER
DRAWN	RCH
CHECKED	MER
APPROVED	JGR
SCALE	1:750

CITY OF OTTAWA
BROUGHTON LANDS – PHASE 1
SANITARY DRAINAGE AREA PLAN

PROJECT No.	102118
DATE	MAY 2007
DRAWING No.	102118–SAN

PLANSIZE - 4000mmX707mm

Drawing: M:\2002\102118\Broughton\CAD\design\102118-SAN.dwg Layout:102118-SAN Updated JUL 17, 2008 at 12:17pm by cvisser

SANITARY DESIGN SHEET
BROUGHTON SUBDIVISION
PHASE 1
JOB #102118

NOVATECH ENGINEERING CONSULTANTS LTD.

LOCATION				INDIVIDUAL AREA AND POPULATION				CUMULATIVE AREA & POPULATION		POPULATION FLOW			TOTAL FLOW	PROPOSED SEWER						
Street	Area Number	From MH	To MH	Area	Dwellings SFH	Dwellings TH	Pop.	Area	Pop.	Peak Factor	Pop. Flow	Infiltration Flow	Total Flow	Length	Dia Act	Dia Nom	Slope	Velocity (Full)	Capacity (Full)	Ratio Q/Qfull
				(ha)				(ha)			(L/s)	(L/s)	(L/s)	(m)	(mm)	(mm)	(%)	(m/s)	(L/s)	(%)
Tillsonburg Street	Fut 3	Fut 3	Cap	2.24	24		81.6	2.24	81.6	4.00	1.32	0.63	1.95		201.2	200	6.15	2.60	82.5	2%
Tillsonburg Street	8	Cap	213	0.29	5	0	17.0	2.53	98.6	4.00	1.60	0.71	2.31	23.5	201.2	200	6.15	2.60	82.5	3%
Tillsonburg Street	7	213	211	0.21	4	0	13.6	11.60	500.90	3.97	9.26	3.68	12.94	31.4	201.2	200	5.50	2.46	78.0	17%
	6	211	209	0.32	6	0	20.4	11.92	521.3	3.96	9.57	3.77	13.34	32.2	201.2	200	5.50	2.46	78.0	17%
	5	209	207	0.29	5	0	17.0	12.21	538.3	3.96	9.83	3.85	13.68	33.1	201.2	200	3.20	1.87	59.5	23%
Tillsonburg Street	4	207	205	0.14	2	0	6.8	12.35	545.1	3.95	8.73	3.46	12.19	30.8	201.2	200	3.20	1.87	59.5	20%
Commercial	1		205	1.45				1.45	0.00	1.50	1.26	0.41	1.66							
	3	205	203	0.08	0	0	0.0	12.43	545.1	3.95	11.19	4.32	15.51	40.2	366.4	200	0.32	0.88	93.2	17%
		203	201	0.00	0	0	0.0	12.43	545.1	3.95	11.19	4.32	15.51	42.1	366.4	200	0.32	0.88	93.2	17%
Future Development	Fut 2	Fut 2	T. Fox	1.91	0	61	164.7	1.91	164.7	4.00	2.67	0.53	3.20		201.2	200	5.50	2.46	78.0	4%
Baylis Lands			201	2.26			146.9	2.26	146.9	4.00	2.38	0.63	3.01	100.0	366.4	375	0.15	0.60	63.8	5%
Richardson Farm			201	23.47			1525.6	25.73	1672.5	3.64	24.69	7.20	31.90	100.0	366.4	375	0.15	0.60	63.8	50%
Terry Fox (along Baylis and Richardson)			201	2.70			0.0	30.34	1837.15	3.61	26.90	8.50	35.39	120.0	366.4	375	0.15	0.60	63.8	55%
Terry Fox		201	917	0.17	0	0	0.0	42.94	2382.3	3.53	36.48	12.86	49.34	120.0	366.4	375	0.15	0.60	63.8	77%
		917	915	0.17	0	0	0.0	43.10	2547.0	3.50	38.59	12.91	51.49	120.0	366.4	375	0.15	0.60	63.8	81%
		915	913	0.17	0	0	0.0	43.27	2547.0	3.50	38.59	12.95	51.54	120.0	366.4	375	0.15	0.60	63.8	81%
		913	911	0.17	0	0	0.0	43.43	2547.0	3.50	38.59	13.00	51.59	120.0	366.4	375	0.15	0.60	63.8	81%
		911	909	0.17	0	0	0.0	43.60	2547.0	3.50	38.59	13.05	51.63	120.0	366.4	375	0.15	0.60	63.8	81%
		909	907	0.17	0	0	0.0	43.76	2547.0	3.50	38.59	13.09	51.68	106.5	366.4	375	0.15	0.60	63.8	81%
		907	905	0.17	0	0	0.0	43.93	2547.0	3.50	38.59	13.14	51.73	106.5	366.4	375	0.15	0.60	83.8	81%
		905	903	0.17	0	0	0.0	44.09	2547.0	3.50	38.59	13.19	51.77	120.0	366.4	375	0.15	0.60	63.8	81%
		903	901	0.17	0	0	0.0	44.26	2547.0	3.50	38.59	13.23	51.82	118.0	366.4	375	0.15	0.60	63.8	81%
		901	EX MH	0.17	0	0	0.0	44.42	2547.0	3.50	38.59	13.28	51.86	34.0	366.4	375	0.15	0.60	63.8	81%

DESIGN PARAMETERS

Average Daily Flow = 350
Commercial/Instutional Flow = 50000
Industrial Flow = 35000
Max Res Peak Factor = 4.00
Comm/Inst Peak Factor = 1.50
Peak factor based on Harmon Equation = 1+(14/4+Pop/1000)^1/2)*1 - (Maximum of 4.0)

Infiltration Flow= 0.28 L/s/ha
Minimum Velocity= 0.6 m/s
Manning's n= 0.013

Richardson and Baylis Lands areas are preliminary and populations are based on 65 persons/ha
* Viva Kanata population flow determined by 50000 L x 1.38 ha x 1.5 Peak Factor / 86400 s = 1.20 L/s

Project: Broughton Subdivision
Client: Kanata Road Inc. c/o Regional Group DCR Phoenix
Date: May 28, 2006
Revised August 24, 2007
May 2, 2008
June 13, 2008
July 18, 2008

Designed: ATR/JA/DDB
Checked: MSP
Dwg. Reference: 102118-SAN

LICENSED PROFESSIONAL ENGINEER
M.J. PETEPIECE
100079354
July 21, 2008
PROVINCE OF ONTARIO

FUTURE RETIREMENT LIVING

FUTURE DEVELOPMENT

FUTURE COMMERCIAL
BLOCK 170
1.20
COM - 200
0.75

FUTURE FLOWS
0.13
102 - 104
0.60

FUTURE FLOWS
Q=259.9 L/S
I=100.24mm/hr
2.78AR=0.72

0.39
102 - 104
0.45

0.05
104 - 106
0.45

FUTURE FLOWS
0.26
106 - 108
0.60

0.29
106 - 108
0.45

FUTURE FLOWS
0.02
108 - 110
0.45

0.48
108 - 110
0.30

FUTURE FLOWS
Q=199.8 L/S
I=98.58mm/hr
2.78AR=2.03

0.05
110 - 210
0.45

0.21
210 - 208
0.45

FUTURE FLOWS
Q=175.6 L/S
I=77.12mm/hr
2.78AR=2.28

0.26
208 - 206
0.45

0.29
206 - 204
0.45

0.15
202 - 200
0.45

0.11
100 - 102
0.45

0.30
525 - 528
0.45

0.31
530 - 532
0.45

0.06
524 - 532
0.45

0.26
500 - 510
0.45

0.23
532 - 502
0.45

0.16
502 - 500
0.45

0.11
504 - 502
0.45

0.30
522 - 520
0.45

0.38
512 - 510
0.45

0.18
506 - 504
0.45

0.15
510 - 508
0.45

0.20
516 - 514
0.45

1.01
204 - 202
0.45

0.06
200 - 198
0.45

DRAINAGE FROM LOTS 135 TO 138 AND REAR YARDS OF LOTS 94 TO 119 SHALL DRAIN INTO THE EXISTING KANATA AVENUE DITCH THROUGH REAR YARD CATCH BASINS

EXISTING DITCH TO BE REALIGNED AND REGRADED APPROXIMATELY 34.0m @ 0.8% EXISTING SIDESLOPES TO BE REGRADED USING 3:1 MAXIMUM SIDE SLOPES.

EXISTING DITCH TO BE REALIGNED AND REGRADED APPROXIMATELY 30.0m @ 0.8% EXISTING SIDESLOPES TO BE REGRADED USING 3:1 MAXIMUM SIDE SLOPES.

HUNTSVILLE DRIVE
INGERSOLL CRESCENT
TILLSONBURG STREET
KANATA AVENUE
INSMILL C
FOX DRIVE
TERRY FOX DRIVE

SEE DRAWINGS 102118-SWM1, 102118-SWM2, 102118-SWM3 & 102118-SWM4 FOR STORMWATER MANAGEMENT & BYPASS CHANNEL DETAILS

LEGEND

- 2.02 / 100–102 / 0.6 — DRAINAGE AREA (hectares) / MANHOLE TO MANHOLE / RUN–OFF COEFFICIENT
- STORM DRAINAGE AREA
- PROPOSED STORM SEWER AND MANHOLE (MH 100)
- DIRECTION OF FLOW
- MAJOR OVERLAND FLOW

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
7	ISSUED FOR MOE APPROVAL	JULY 18/08	MSP
6	REVISED AS PER CITY COMMENTS	JUN 20/08	MSP
5	REVISED AS PER CITY COMMENTS	APR 29/08	MSP
4	REVISED AS PER CITY COMMENTS	DEC 14/07	MSP
3	ISSUED FOR TENDER	AUG 29/07	MSP
2	REVISED LOT LAYOUT	AUG 24/07	MSP
1	ISSUED FOR CITY REVIEW	JULY 16/07	MSP

REGISTERED PROFESSIONAL ENGINEER — J. G. RIDDELL — PROVINCE OF ONTARIO — JULY 21/08

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email novainfo@novatech-eng.com

DESIGN	MSP
CHECKED	JGR
DRAWN	CAH
CHECKED	MSP
APPROVED	JGR

SCALE: 1 : 750

CITY OF OTTAWA
BROUGHTON LANDS – PHASE 1
STORM DRAINAGE AREA PLAN

PROJECT No. 102118
DATE JANUARY 2007
DRAWING No. 102118–STM

PLANLDWG - 1500mmX770mm

Drawing M:\2002\102118\Broughton\CAD\design\102118-STM.dwg Layout:STM Updated JUL 18, 2008 at 10:14am by cvisser

STORM DESIGN SHEET
BROUGHTON SUBDIVISION
PHASE 1
JOB#102118

NOVATECH ENGINEERING CONSULTANTS LTD.

Return Frequency = 5 years

Location	LOCATION		Area (ha)					FLOW					SEWER DATA								
	From Node	To Node	R= 0.20	R= 0.45	R= 0.60	R= 0.75	R= 0.90	Indiv 2.78 AC	Accum 2.78 AC	Time of Conc.	Rainfall Intensity	Peak Flow Q (l/s)	Dia. (m) Actual	Dia. (mm) Nominal	Type	Slope (%)	Length (m)	Capacity (l/s)	Velocity (m/s)	Time of Flow (min)	Ratio Q/Q full
Huntsville Drive	100	102		0.11				0.14	0.14	15.00	83.56	11.5	0.254	250	PVC	1.50	36.7	75.9	1.50	0.41	15%
										15.41											
Battersea Crescent	Future Development	CAP			0.43			0.72	0.72	10.78	100.24	259.9	0.457	450	PVC	4.00	35.2	594.4	3.62	0.16	44%
	CAP	102							0.72	10.94	99.46	259.3	0.457	450	PVC	4.00	11.6	594.4	3.62	0.05	44%
										11.00											
Huntsville Drive	102	104		0.29	0.13			0.58	1.43	15.41	82.26	117.9	0.610	600	CONC	0.70	45.9	535.6	1.84	0.42	22%
	104	106		0.05				0.06	1.50	15.83	80.98	121.2	0.610	600	CONC	0.70	37.4	535.6	1.84	0.34	23%
	106	108		0.24	0.26			0.73	2.23	16.16	79.97	178.4	0.610	600	CONC	0.70	56.2	535.6	1.84	0.51	33%
	108	110		0.18				0.23	2.46	16.68	78.51	192.8	0.610	600	CONC	0.70	19.5	535.6	1.84	0.18	36%
										16.85											
Huntsville Drive	Future Development	CAP	0.93	0.82	0.29			2.03	2.03	11.13	98.58	199.8	0.381	375	CONC	4.00	6.2	365.5	3.21	0.03	55%
	CAP	110						0.00	2.03	11.16	98.43	199.5	0.381	375	CONC	4.00	18.2	365.5	3.21	0.09	55%
										11.26											
Ingersoll Crescent	524	522		0.08				0.10	0.10	10.00	104.19	10.4	0.254	250	PVC	1.20	50.3	67.9	1.34	0.63	15%
	522	520		0.30				0.38	0.48	10.63	101.00	48.0	0.305	300	PVC	1.20	64.4	110.4	1.51	0.71	43%
	520	518						0.00	0.48	11.33	97.63	46.4	0.381	375	PVC	1.20	17.9	200.2	1.76	0.17	23%
	518	516						0.00	0.48	11.50	96.86	46.0	0.381	375	PVC	1.20	11.0	200.2	1.76	0.10	23%
	516	514		0.20				0.25	0.73	11.61	96.40	69.9	0.457	450	CONC	0.25	12.0	148.6	0.91	0.22	47%
	514	512						0.00	0.73	11.83	95.43	69.2	0.457	450	CONC	0.25	11.8	148.6	0.91	0.22	47%
	512	510		0.38				0.48	1.20	12.05	94.49	113.5	0.533	525	CONC	0.25	25.7	224.2	1.00	0.43	51%
	510	508		0.15				0.19	1.39	12.47	92.72	128.7	0.533	525	CONC	0.25	29.1	224.2	1.00	0.48	57%
	508	506						0.00	1.39	12.96	90.79	126.1	0.533	525	CONC	0.25	25.7	224.2	1.00	0.43	56%
	506	504		0.18				0.23	1.61	13.38	89.17	143.9	0.610	600	CONC	0.25	29.1	320.1	1.10	0.44	45%
	504	502		0.11				0.14	1.75	13.83	87.55	153.3	0.610	600	CONC	0.25	38.3	320.1	1.10	0.58	48%
										14.41											
Ingersoll Crescent	524	526						0.00	0.00	10.00	104.19	0.0	0.254	250	PVC	0.50	12.5	43.8	0.86	0.24	0%
	526	528		0.30				0.38	0.38	10.24	102.94	38.6	0.305	300	PVC	0.50	17.6	71.3	0.98	0.30	54%
	528	530						0.00	0.38	10.48	101.72	38.2	0.305	300	PVC	0.50	22.9	71.3	0.98	0.39	54%
	530	532		0.31				0.39	0.76	10.78	100.24	76.5	0.381	375	PVC	0.50	20.1	129.2	1.13	0.30	59%
	532	502		0.23				0.29	1.05	11.17	98.38	103.4	0.381	375	PVC	1.15	44.5	196.0	1.72	0.43	53%
										11.60											
Ingersoll Crescent	502	500		0.16				0.20	3.00	14.41	85.52	256.8	0.610	600	CONC	0.25	39.3	320.1	1.10	0.60	80%
	500	110		0.25				0.31	3.32	15.01	83.54	276.9	0.686	875	CONC	0.25	51.0	438.2	1.19	0.72	63%
										15.72											
Huntsville Drive	110	210		0.05				0.06	7.86	16.85	78.01	613.2	0.762	750	CONC	2.00	81.0	1,641.6	3.60	0.38	37%
										17.23											
Tillsonburg Street	Future Development	CAP		1.82				2.28	2.28	17.18	77.12	175.6	0.381	375	PVC	5.38	19.0	423.9	3.72	0.09	41%
	CAP	210						0.00	2.28	17.27	76.89	175.1	0.381	375	PVC	5.38	21.6	423.9	3.72	0.10	41%
										17.36											

Broughton Lands Subdivision (Phase 1): Catchbasin Design Sheet

1:100 Year Event

Location					Area							Curb Information					Design Information																		
																																	FLOW USED IN HGL ANALYSIS	Velocity x Depth			
Street	From MH	To MH	From CB	To CB	C = 0.3	C = 0.45	C = 0.6	C = 0.75	Indiv 2.78AC	Indiv T_c (min)	Indiv Rainfall Intensity (mm/hr)	Indiv Peak Flow (L/s)	Type	Height	Gutter Width	Manning's n	Gutter Slope	Lane Width (m)	Allowable Spread, T	Gutter Grade S_o	Cross Fall S_x	Spread (one side) T	Flow Depth (m)	Max. CB Inlet Rate (both sides) (L/s)	ICD Diameter (mm)	Max. ICD Inlet Rate (L/s)	Approach Flow (L/s)	% of Approach Flow in Gutter (Over CBs) See MTO Chart 4.22 T/W	(L/s)	Captured Flow* (L/s)	Carry-Over (L/s)	Total Inflow (L/s)	Flow Area per side (m^2)	Velocity (m/s)	Depth (m)	Velocity x Depth (m^2/s)
													Barrier / Mountable	150 mm / 75 mm	400 mm / 800 mm	0.013 / 0.013	6.0% / 6.0%																		
Future Development																																Flows determined from Phase 2 Catchbasin Design Sheet				
Battersea Crescent	-	*104*	-	*111-112*			*0.43*		0.72	10.00	178.56	128.1																			*272.8*	*205.5*	*272.8*				
Ingersoll Crescent	*308*	*110*	-	*104*	*0.93*	*0.82*	*0.31*		2.32	10.00	178.56	414.0																			*254.8*	*22.3*	*231.0*				
Tillsonburg Street	-	*210*	-	*115-116*		*1.82*			2.28	10.00	178.56	406.5																			*270.6*	*50.2*	*269.5*				
Commercial	-	*200*	-	*125-126*				*1.20*	2.50	10.00	178.56	446.8																			*315.0*	0.0	*315.0*				
Phase 1 Development																																				
Huntsville Drive	100	102	111-112	113-114		0.11			0.14	10.00	178.56	24.6	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	3.9%	3.0%	0.94 m	0.05 m	68.5	83	18.8	230.1	69%	220.8	18.8	211.3				
Huntsville Drive	102	104	-	RY200	0.19				0.16	15.00	142.89	22.6																					41.4				
Huntsville Drive	102	104	VPI	111-112		0.23			0.29	10.00	178.56	51.4	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	4.7%	3.0%	0.95 m	0.05 m	89.5	127	44.0	262.6	69%	251.3	44.0	218.6	339.4	0.027	4.8	0.05	0.25
Huntsville Drive	104	106	VPI	109-110		0.05			0.06	10.00	178.56	11.2	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	1.0%	3.0%	1.33 m	0.06 m	71.0	83	18.8	229.8	49%	192.2	18.8	211.0	356.2	0.047	2.4	0.06	0.16
Huntsville Drive	106	108	-	RY201	0.26				0.22	15.00	142.89	31.0																								
Huntsville Drive	106	108	109-110	107-108		0.16			0.20	10.00	178.56	35.7	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	3.6%	3.0%	0.97 m	0.05 m	68.5	94	24.1	246.8	67%	234.3	24.1	222.7	413.8	0.028	4.3	0.05	0.23
Huntsville Drive	108	110	-	RY232	0.08				0.07	15.00	142.89	9.5																								
Huntsville Drive	108	110	107-108	105-106		0.18			0.23	10.00	178.56	40.2	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	5.0%	3.0%	0.95 m	0.05 m	69.5	94	24.1	262.9	69%	251.4	24.1	238.8	447.0	0.027	4.8	0.05	0.25
Huntsville Drive	108	110	105-106	153		0.05			0.06	10.00	178.56	11.2	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	2.3%	3.0%	1.22 m	0.06 m	29.0	83	18.8	272.2	53%	237.4	18.8	253.4	1,164.4	0.041	3.3	0.06	0.20
EASEMENT	110	210	153	117-118		-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,164.4				
Tillsonburg Street	210	208	115-116	117-118		0.21			0.26	10.00	178.56	46.9	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	8.0%	3.0%	1.05 m	0.06 m	71.0	102	28.4	350.5	62%	324.7	28.4	322.1	1,463.4	0.032	5.5	0.06	0.30
Tillsonburg Street	208	206	117-118	119-120		0.26			0.33	10.00	178.56	58.1	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	6.0%	3.0%	1.10 m	0.06 m	71.0	127	44.0	380.2	59%	346.8	44.0	336.2	1,507.4	0.034	5.5	0.06	0.32
Tillsonburg Street	206	204	119-120	121-122		0.24			0.30	10.00	178.56	53.6	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	6.0%	3.0%	1.11 m	0.06 m	71.0	108	31.8	389.8	59%	353.8	31.8	358.0	1,539.2	0.035	5.6	0.06	0.32
Tillsonburg Street	204	202	-	DICB	1.01				0.84	15.00	142.89	120.4																					1,539.2				
Tillsonburg Street	202	200	121-122	123-124		0.16			0.20	15.00	142.89	28.6	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	4.8%	3.0%	1.16 m	0.06 m	69.5	152	63.0	386.6	56%	345.1	63.0	323.6	1,722.6	0.037	5.2	0.06	0.30
Tillsonburg Street	200	198	123-124	125-126		0.06			0.08	10.00	178.56	13.4	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	1.4%	3.0%	1.60 m	0.07 m	88.0	127	44.0	337.0	41%	255.1	44.0	**293.0**	2,081.6	0.063	2.7	0.07	0.19
Ingersoll Crescent	500	110	-	RY202	0.11				0.09	15.00	142.89	13.1																					443.9				
Ingersoll Crescent	500	110	-	127-128		0.14			0.18	10.00	178.56	31.3	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	2.1%	3.0%	0.32 m	0.05 m	30.0	83	18.8	31.3	100%	31.3	18.8	12.5	443.9	0.008	1.8	0.05	0.09
Ingersoll Crescent	502	500	127-128	129-130		0.16			0.20	10.00	178.56	35.7	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	2.2%	3.0%	0.45 m	0.05 m	30.0	94	24.1	48.2	100%	48.2	24.1	24.1	412.0	0.012	2.0	0.05	0.10
Ingersoll Crescent	526	528	-	RY205	0.2				0.17	15.00	142.89	23.8																								
Ingersoll Crescent	526	528	-	147-148		0.10			0.13	10.00	178.56	22.3	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	0.3%	3.0%	0.32 m	0.05 m	23.0	83	18.8	22.3	100%	22.3	18.8	3.5	42.6	0.009	1.3	0.05	0.06
Ingersoll Crescent	528	530	-	-		-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42.6				
Ingersoll Crescent	530	532		RY206	0.06				0.05	15.00	142.89	7.2																								
Ingersoll Crescent	530	532	147-148	149-150		0.25			0.31	10.00	178.56	55.8	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	0.5%	3.0%	0.64 m	0.05 m	33.5	127	44.0	59.4	100%	59.4	33.5	25.9	83.3	0.017	1.7	0.05	0.08
Ingersoll Crescent	532	502	149-150	151-152		0.23			0.29	10.00	178.56	51.4	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	0.5%	3.0%	0.75 m	0.05 m	33.5	2 x 83	35.2	77.3	86%	77.0	33.5	43.8	116.8	0.020	1.9	0.05	0.09
Ingersoll Crescent	504	502	129-130	131-132		0.11			0.14	10.00	178.56	24.6	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	0.8%	3.0%	0.83 m	0.05 m	33.5	102	28.4	92.4	78%	91.0	28.4	64.0	271.1	0.022	2.1	0.05	0.10
Ingersoll Crescent	506	504	131-132	133-134		0.18			0.23	10.00	178.56	40.2	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	0.8%	3.0%	0.89 m	0.05 m	44.0	102	28.4	104.3	73%	101.3	28.4	75.9	242.7	0.025	2.1	0.05	0.11
Ingersoll Crescent	508	506	-	-		-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	214.3				
Ingersoll Crescent	510	508	133-134	135-136		0.15			0.19	10.00	178.56	33.5	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	0.8%	3.0%	0.91 m	0.05 m	44.0	102	28.4	109.4	71%	105.7	28.4	81.0	214.3	0.026	2.1	0.05	0.11
Ingersoll Crescent	512	510		RY203	0.24				0.20	15.00	142.89	28.6																								
Ingersoll Crescent	512	510	135-136	137-138		0.14			0.18	10.00	178.56	31.3	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	0.8%	3.0%	0.92 m	0.05 m	44.0	102	28.4	112.2	70%	108.1	28.4	83.8	185.9	0.026	2.1	0.05	0.11
Ingersoll Crescent	514	512	-	-		-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	128.9				
Ingersoll Crescent	516	514	-	-		-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	128.9				
Ingersoll Crescent	524	522	-	145-146		0.08			0.10	10.00	178.56	17.9	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	0.9%	3.0%	0.27 m	0.05 m	23.0	83	18.8	17.9	100%	17.9	17.9	0.0	17.9	0.007	1.3	0.05	0.06
Ingersoll Crescent	522	520	145-146	143-144		0.17			0.21	10.00	178.56	38.0	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	1.2%	3.0%	0.48 m	0.05 m	23.0	94	24.1	38.0	100%	38.0	23.0	15.0	55.8	0.013	1.5	0.05	0.07
Ingersoll Crescent	522	520	143-144	141-142		0.13			0.16	10.00	178.56	29.0	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	1.2%	3.0%	0.53 m	0.05 m	23.0	83	18.8	44.0	100%	44.0	18.8	25.2	84.9	0.014	1.6	0.05	0.08
Ingersoll Crescent	516	520	141-142	139-140		0.20			0.25	10.00	178.56	44.7	Mountable	0.075 m	0.800 m	0.013	6.0%	4.25 m	2.13 m	1.2%	3.0%	1.09 m	0.06 m	-	127	44.0	153.7	60%	140.5	44.0	**109.7**	126.9	0.034	2.3	0.06	0.13
												2482.1																								

* Captured Flow is minimum of either:
1) Approach Flow
2) CB Capture Rate
3) ICD Rate

Check	
Captured Flow:	2081.6
Overland @ Kanata Ave:	109.7
Overland @ Terry Fox:	293.0
	2484.4

STORM DESIGN SHEET
BROUGHTON SUBDIVISION
PHASE 1
JOB#102118

NOVATECH ENGINEERING CONSULTANTS LTD.

Return Frequency = 5 years

Location	LOCATION		Area (ha)					FLOW					SEWER DATA								
	From Node	To Node	R= 0.20	R= 0.45	R= 0.60	R= 0.75	R= 0.90	Indiv 2.78 AC	Accum 2.78 AC	Time of Conc.	Rainfall Intensity	Peak Flow Q (l/s)	Dia. (m) Actual	Dia. (mm) Nominal	Type	Slope (%)	Length (m)	Capacity (l/s)	Velocity (m/s)	Time of Flow (min)	Ratio Q/Q full
Tillsonburg Street	210	208		0.21				0.26	10.46	17.36	76.63	801.7	0.838	825	CONC	4.50	34.8	3,175.0	5.75	0.10	25%
	208	206		0.26				0.33	10.79	17.46	76.36	823.7	0.838	825	CONC	4.50	32.6	3,175.0	5.75	0.09	26%
	206	204		0.24				0.30	11.09	17.56	76.11	843.9	0.838	825	CONC	3.20	30.6	2,677.4	4.85	0.11	32%
	204	202		1.01				1.26	12.35	17.66	75.84	936.7	0.838	825	CONC	3.20	34.4	2,677.4	4.85	0.12	35%
	202	200		0.16				0.20	12.55	17.78	75.53	948.0	0.991	975	CONC	0.32	28.0	1,321.9	1.72	0.27	72%
	200	198		0.06		1.20		2.58	15.13	18.05	74.84	1,132.1	1.067	1050	CONC	0.32	47.0	1,610.8	1.80	0.43	70%
	198	196						0.00	15.13	18.49	73.76	1,115.8	0.838	825	CONC	0.10	58.4	**Refer to SWM report for detailed EPA SWMM model downstream of MH 198 Flow Splitter**			
	196	194						0.00	15.13	18.49	73.76	1,115.8	0.838	825	CONC	0.10	14.1				
	196	Outlet						0.00	15.13	18.49	73.76	1,115.8	0.838	825	CONC	0.10	10.6				
										18.49											

DESIGN PARAMETERS

Definitions:

Q=2.78 AIR, where
Q=Peak Flow in Litres per Second (l/s)
A=Area in hectares (ha)
I=Rainfall Intensity (mm/hr)
R=Runoff Coefficient

Notes:

1) Ottawa Rainfall-Intensity Curve
2) Min Pipe Velocity =0.80 m/s
3) Tc=15 min (subdivision)

PROJECT INFORMATION

Storm Design: Novatech Engineering Consultants Ltd.

Project: Broughton Subdivision — Designed: ATR/DDB
Client: Kanata Road Inc. — Checked: MSP
c/o Regional Group / DCR Phoenix
Date: July 13, 2007 — Dwg. Reference: 102118-STM
Revised June 13, 2008
Revised July 18, 2008

LICENSED PROFESSIONAL ENGINEER
M.J. PETEPIECE
100079354
July 21, 2009
PROVINCE OF ONTARIO

APPENDIX C

Sanitary Sewer, Watermain and Fire Flow Calculations

HERITAGE HILLS RETAIL PLAZA
Sanitary Flow

Building 1 Retail	2,251	m^2
Average Daily Volume	5	L/m^2/day
Average Sanitary Flow	0.13	L/s
Commercial Peak Factor	1.50	
Peak Sanitary Flow	**0.20**	**L/s**
Gas Station	211	m^2
Number of Fuel Outlets	8	
Average Daily Volume	560	L/outlet/day
Number of Water Closets	2	
Average Daily Volume	950	
Average Sanitary Flow	0.07	L/s
Commercial Peak Factor	1.50	
Peak Sanitary Flow	**0.11**	**L/s**
Car Wash		
Peak Sanitary Sanitary Flow	54	USGPM
Peak Sanitary Flow	**3.41**	**L/s**
Peak Commercial Flow	**3.71**	**L/s**
Site Area	1.18	ha
Infiltration Allowance	0.28	L/s/ha
Peak Extraneous Flows	**0.33**	**L/s**
Total Peak Sanitary Flow	**4.04**	**L/s**

BOUNDARY CONDITIONS

Boundary Conditions For: 471 Terry Fox Dr.

Date of Boundary Conditions: 2018-Sep-21

Provided Information:

Scenario	Demand	
	L/min	L/s
Average Daily Demand	28.8	0.5
Maximum Daily Demand	43.8	0.7
Peak Hour	78.6	1.3
Fire Flow #1 Demand	3,000	50.0
Fire Flow #2 Demand	6,000	100.0
Fire Flow #3 Demand	7,000	117.0

Number Of Connections: 1

Location:

BOUNDARY CONDITIONS

Results:

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	162.3	94.5
Peak Hour	157.8	88.1
Max Day Plus Fire (3,000) L/min	157.3	87.4
Max Day Plus Fire (6,000) L/min	150.8	78.2
Max Day Plus Fire (7,000) L/min	147.9	74.0

[1]Elevation: **95.810 m**

Notes:

1) 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:

a) 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.
b) 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.

2) City of Ottawa do not allow connections to dead end mains.

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.

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118133
Project Name: Heritage Hills
Date: 10/1/2019
Input By: Steve Matthews
Reviewed By: Miroslav Savic

Legend: Input by User; No Information or Input Required

Building Description: 1 Storey Retail Building
Non-combustible construction

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	2281			
		Number of Floors/Storeys	1			
		Area of structure considered (m^2)			**2,251**	
	F	**Base fire flow without reductions**				**8,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**6,800**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-2,720**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	No	-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**2,040**
		East Side	20.1 - 30 m		10%	
		South Side	> 45.1m		0%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**30%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**6,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**100**
				or	USGPM	1,585
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	720

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118133
Project Name: Heritage Hills
Date: 9/11/2018
Input By: Steve Matthews
Reviewed By: Miroslav Savic

Legend: Input by User; No Information or Input Required

Building Description: Shell Convenience Store
Non-combustible construction

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	211			
		Number of Floors/Storeys	1			
		Area of structure considered (m^2)			**211**	
	F	**Base fire flow without reductions**				**3,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**3,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	30.1- 45 m		5%	**450**
		East Side	> 45.1m		0%	
		South Side	> 45.1m		0%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**15%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**3,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**50**
				or	USGPM	793
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	1.25
		Required Volume of Fire Flow (m^3)			m^3	225

HERITAGE HILLS RETAIL PLAZA
WATER DEMAND

Retail Plaza		
Floor Area	2,251	m^2
Average Day Demand	5	$L/m^2/day$
Average Day Demand	0.13	L/s
Maximum Day Demand	0.20	L/s
Peak Hour Demand	0.35	L/s
Gas Station Convenience Store		
Floor Area	211	m^2
Number of Fuel Outlets	8	
Average Day Demand	560	L/outlet/day
Number of water closets	2	
Average Day Demand	950	
Average Day Demand	0.07	L/s
Maximum Day Demand	0.11	L/s
Peak Hour Demand	0.20	L/s
Car Wash		
Maximum Water Demand	54	USGPM
Maximum Water Demand	3.41	L/s

HERITAGE HILLS RETAIL PLAZA
WATERMAIN ANALYSIS RESULTS

Maximum Day + Fire Flow Demand
Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m	kPa	psi
Junc J1	96.9	0	141.92	45.02	441.65	64.06
Junc J2	96.4	0	140.24	43.84	430.07	62.38
Junc J3	96.75	100	137.8	41.05	402.70	58.41
Junc J4	96.95	0.2	140.24	43.29	424.67	61.59
Junc J5	96.6	0	141.91	45.31	444.49	64.47
Junc J6	96.65	0	141.91	45.26	444.00	64.40
Junc J7	96.7	3.41	141.83	45.13	442.73	64.21
Junc J8	96.9	0.11	141.83	44.93	440.76	63.93
Resvr R1	150.8	-103.72	150.8	0	0.00	0.00

Maximum Day + Fire Flow Demand
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Unit Headloss m/km
Pipe P1	131.5	200	110	103.72	3.3	67.52
Pipe P2	26.5	200	110	100.2	3.19	63.34
Pipe P3	8	150	100	100	5.66	305.7
Pipe P4	35	100	100	0.2	0.03	0.02
Pipe P5	21	150	100	3.52	0.2	0.62
Pipe P6	4	150	100	3.52	0.2	0.62
Pipe P7	4	75	100	3.52	0.8	18.19
Pipe P8	18	50	100	0.11	0.06	0.21

HERITAGE HILLS RETAIL PLAZA
WATERMAIN ANALYSIS RESULTS

Peak Hour Demand
Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m	kPa	psi
Junc J1	96.9	0	157.78	60.88	597.23	86.62
Junc J2	96.4	0	157.78	61.38	602.14	87.33
Junc J3	96.75	0	157.78	61.03	598.70	86.83
Junc J4	96.95	0.36	157.78	60.83	596.74	86.55
Junc J5	96.6	0	157.77	61.17	600.08	87.03
Junc J6	96.65	0	157.76	61.11	599.49	86.95
Junc J7	96.7	3.41	157.69	60.99	598.31	86.78
Junc J8	96.9	0.2	157.67	60.77	596.15	86.46
Resvr R1	157.8	-3.97	157.8	0	0.00	0.00

Peak Hour Demand
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Unit Headloss m/km	
Pipe P1	131.5	200	110	3.97	0.13	0.16	0.039
Pipe P2	26.5	200	110	0.36	0.01	0	0.067
Pipe P3	8	150	100	0	0	0	0
Pipe P4	35	100	100	0.36	0.05	0.07	0.062
Pipe P5	21	150	100	3.61	0.2	0.65	0.046
Pipe P6	4	150	100	3.61	0.2	0.65	0.046
Pipe P7	4	75	100	3.61	0.82	19.06	0.042
Pipe P8	18	50	100	0.2	0.1	0.65	0.061

HERITAGE HILLS RETAIL PLAZA
WATERMAIN ANALYSIS RESULTS

Average Day Demand
Network Table - Nodes

	Elevation	Demand	Head	Pressure		
Node ID	m	LPS	m	m	kPa	psi
Junc J1	96.9	0	162.3	56.2	551.32	79.96
Junc J2	96.4	0	162.3	65.9	646.48	93.76
Junc J3	96.75	0	162.3	65.55	643.05	93.27
Junc J4	96.95	0.13	162.3	65.35	641.08	92.98
Junc J5	96.6	0	162.3	65.7	644.52	93.48
Junc J6	96.65	0	162.3	65.65	644.03	93.41
Junc J7	96.7	0	162.3	65.6	643.54	93.34
Junc J8	96.9	0.07	162.3	65.4	641.57	93.05
Resvr R1	162.3	-0.2	162.3	0	0.00	0.00

Average Day Demand
Network Table - Links

	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss	
Link ID	m	mm		LPS	m/s	m/km	
Pipe P1	131.5	200	110	0.2	0.01	0	0.039
Pipe P2	26.5	200	110	0.13	0	0	0.067
Pipe P3	8	150	100	0	0	0	0
Pipe P4	35	100	100	0.13	0.02	0.01	0.062
Pipe P5	21	150	100	0.07	0	0	0.046
Pipe P6	4	150	100	0.07	0	0	0.046
Pipe P7	4	75	100	0.07	0.02	0.01	0.042
Pipe P8	18	50	100	0.07	0.04	0.09	0.061

APPENDIX D

Stormwater Management Calculations

STORM SEWER DESIGN SHEET

2-year Design Event

PROJECT #: 118133
DESIGNED BY : SM
CHECKED BY : CMS
DATE: 24-Jan-19

Heritage Hills Retail Plaza
471 Terry Fox Drive

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION				INDIV	INDIV	INDIV	ACCUM	TIME OF	RAINFALL	Peak Flow (Q)		PROPOSED SEWER								% FULL (Q/Qfull)	
STREET	FROM M.H.	TO M.H.	Area #	AREA (ha)	R	2.78 AR	2.78 AR	CONC (min)	INTENSITY (mm/hr)	UNCONTROLLED (L/s)	CONTROLLED (L/s)	TYPE OF PIPE	PIPE SIZE (mm)	PIPE ID (mm)	GRADE %	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY	TIME OF FLOW (min)	UNCONTROLLED	CONTROLLED
On-Site	STM MH 4	STM MH 3	A-3	0.142	0.89	0.35	1.39	10.00	76.81	**107.0**	**110.4**	CONC	450	457	0.20	88.1	**133.0**	0.81	1.81	**80.5%**	**83.0%**
			A-2	0.167	0.82	0.38															
			A-1	0.054	0.64	0.10															
			R-1	0.226	0.90	0.57															
On-Site	STM MH 3	STM MH 2	-	-	-	-	1.39	11.81	70.48	**98.2**	**110.4**	CONC	450	457	0.20	7.5	**133.0**	0.81	0.15	**73.8%**	**83.0%**
On-Site	STM MH 2	STM MH 1	-	-	-	-	1.39	11.97	70.00	**97.5**	**110.4**	CONC	450	457	0.20	11.8	**133.0**	0.81	0.24	**73.3%**	**83.0%**
Connection Off-Site	STM MH 1	EX. MH 202 (connection)	-	-	-	-	1.39	12.21	69.25	**96.5**	**110.4**	CONC	450	457	1.00	7.5	**297.4**	1.81	0.07	**32.4%**	**37.1%**
								12.28													

Definitions:

Q = Peak Flow in Litres per Second (L/s)
Q = 2.78 AIR, where
A = Area in hectares (ha)
I = Rainfall Intensity (mm/hr)
R = Runoff Coefficient

Notes (General):

1) Rainfall Intensity Curves are City of Ottawa IDF Curves $I_{(2\text{-year})}$ = 732.951 / [(Tc(min)+6.199)]^0.810
2) Minumum Tc is 10-min as per the Ottawa Design Guidelines.
3) Roughness Coefficient 'n' in Manning's formula shall be 0.013 for Concrete, HDPE (smooth inner wall) and PVC pipes as per the Ottawa Guidelines.
4) Minimum diameter for on-site sewer is 250mm.
5) Controlled Flow based on PCSWMM Stormwater Management Model for a 100-year 4-hour Chicago Storm

Heritage Hills Retail Plaza (471 Terry Fox Drive)
PCSWMM Storage Tables

NOVATECH
Engineers, Planners & Landscape Architects

Roof Drain Storage Table for Area R-1 *(0.15m ponding depth)*		
Depth (m)	**Total Area (m^2)**	**Total Volume (m^3)**
0.00	0	0
0.05	281.89	7.0
0.10	892.01	36.4
0.15	1649.08	99.9
0.16	0	108.2
1.00	0	108.2

Area A-1 Storage Table (CB01) 0.20m Ponding Depth			
Elev. (m)	**Depth (m)**	**Ponding**	
		Area (m^2)	**Volume (m^3)**
95.00	0.00	0.36	0.00
96.45	1.45	0.36	0.00
96.50	1.50	13.15	0.34
96.55	1.55	52.59	1.98
96.60	1.60	111.22	6.08
96.65	1.65	138.41	12.32
96.66	1.66	0.00	13.01
98.90	2.45	0.00	13.01

Area A-2 Storage Table (CB02) 0.23m Ponding Depth			
Elev. (m)	**Depth (m)**	**Ponding**	
		Area (m^2)	**Volume (m^3)**
95.06	0.00	0.36	0.00
96.40	1.34	0.36	0.00
96.45	1.39	19.43	0.49
96.50	1.44	75.46	2.87
96.55	1.49	161.89	8.80
96.60	1.54	285.45	19.98
96.63	1.57	394.46	30.18
96.64	1.58	0.00	32.16
97.40	2.34	0.00	32.16

Area A-3 Storage Table (CB03) 0.21m Ponding Depth			
Elev. (m)	**Depth (m)**	**Ponding**	
		Area (m^2)	**Volume (m^3)**
95.22	0.00	0.36	0.00
96.40	1.18	0.36	0.00
96.45	1.23	18.29	0.47
96.50	1.28	73.59	2.76
96.55	1.33	165.41	8.74
96.61	1.39	294.22	22.53
96.62	1.40	0.00	24.00
97.40	2.18	0.00	24.00

Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA R-1 **Controlled Roof Drain 1**

OTTAWA IDF CURVE

Area =	0.017	ha	Qallow =	0.79	L/s
C =	0.90		Vol(max) =	2.7	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	6.00	5.21	1.56
10	104.19	4.43	3.64	2.19
15	83.56	3.55	2.76	2.49
20	70.25	2.99	2.20	2.64
25	60.90	2.59	1.80	2.70
30	53.93	2.29	1.50	2.71
35	48.52	2.06	1.27	2.67
40	44.18	1.88	1.09	2.61
45	40.63	1.73	0.94	2.53
50	37.65	1.60	0.81	2.43
55	35.12	1.49	0.70	2.32
60	32.94	1.40	0.61	2.20
65	31.04	1.32	0.53	2.07
70	29.37	1.25	0.46	1.93
75	27.89	1.19	0.40	1.78
90	24.29	1.03	0.24	1.31
105	21.58	0.92	0.13	0.81
120	19.47	0.83	0.04	0.27

Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA R-1 **Controlled Roof Drain 1**

OTTAWA IDF CURVE

Area =	0.017	ha	Qallow =	1.10	L/s
C =	1.00		Vol(max) =	5.9	m3

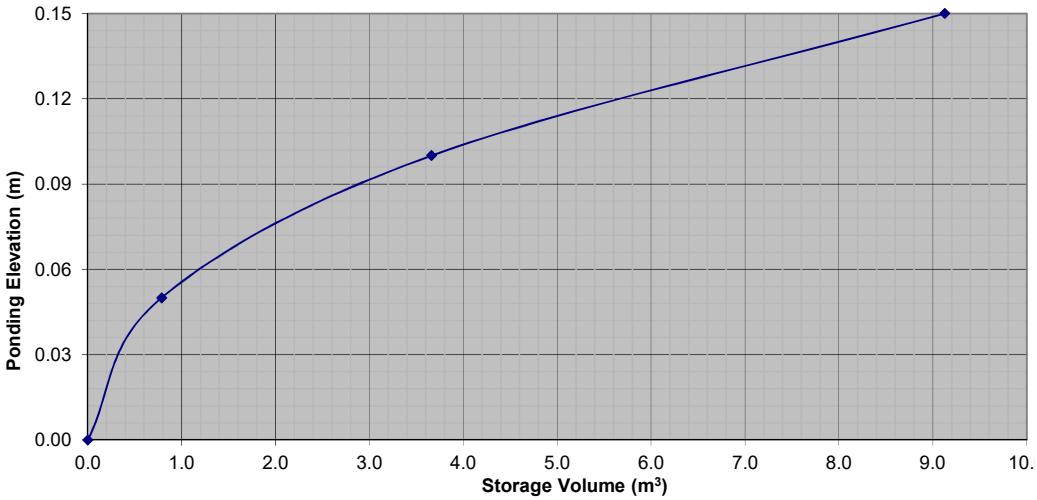
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	11.47	10.37	3.11
10	178.56	8.44	7.34	4.40
15	142.89	6.75	5.65	5.09
20	119.95	5.67	4.57	5.48
25	103.85	4.91	3.81	5.71
30	91.87	4.34	3.24	5.84
35	82.58	3.90	2.80	5.89
40	75.15	3.55	2.45	5.88
45	69.05	3.26	2.16	5.84
50	63.95	3.02	1.92	5.77
55	59.62	2.82	1.72	5.67
60	55.89	2.64	1.54	5.55
65	52.65	2.49	1.39	5.41
70	49.79	2.35	1.25	5.26
75	47.26	2.23	1.13	5.10
90	41.11	1.94	0.84	4.55
105	36.50	1.72	0.62	3.94
120	32.89	1.55	0.45	3.27

Watts Accutrol Flow Control Roof Drains:		RD-100-A-ADJ set to 1/2 Exposed			
Design Event	**Flow/Drain (L/s)**	**Total Flow (L/s)**	**Ponding (cm)**	**Storage (m^3) Required**	**Provided**
1:5 Year	0.79	0.79	9	2.7	9.1
1:100 Year	1.10	1.10	13	5.9	9.1

Roof Drain Storage Table for Area R-1

Elevation	Area RD 1	Total Volume
m	m^2	m^3
0.00	0	0
0.05	31.47	0.8
0.10	83.5	3.7
0.15	135.18	9.1

Stage Storage Curve: Area R-1
Controlled Roof Drain #1



Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA R-1 **Controlled Roof Drain 2**

OTTAWA IDF CURVE

Area =	0.010	ha	Qallow =	0.79	L/s
C =	0.90		Vol(max) =	1.2	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	3.53	2.74	0.82
10	104.19	2.61	1.82	1.09
15	83.56	2.09	1.30	1.17
20	70.25	1.76	0.97	1.16
25	60.90	1.52	0.73	1.10
30	53.93	1.35	0.56	1.01
35	48.52	1.21	0.42	0.89
40	44.18	1.11	0.32	0.76
45	40.63	1.02	0.23	0.61
50	37.65	0.94	0.15	0.46
55	35.12	0.88	0.09	0.29
60	32.94	0.82	0.03	0.12
65	31.04	0.78	-0.01	-0.05
70	29.37	0.73	-0.06	-0.23
75	27.89	0.70	-0.09	-0.42
90	24.29	0.61	-0.18	-0.98
105	21.58	0.54	-0.25	-1.58
120	19.47	0.49	-0.30	-2.18

Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA R-1 **Controlled Roof Drain 2**

OTTAWA IDF CURVE

Area =	0.010	ha	Qallow =	0.95	L/s
C =	1.00		Vol(max) =	2.9	m3

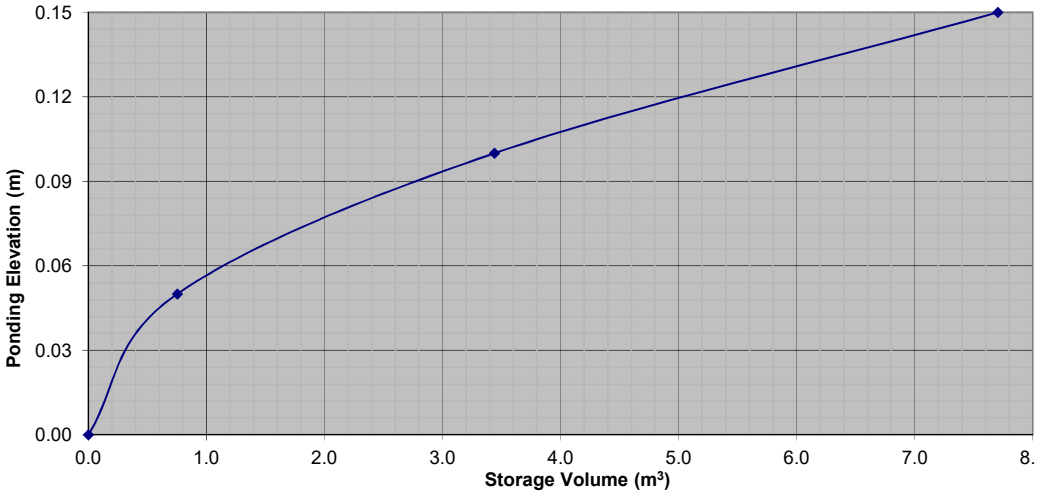
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	6.75	5.80	1.74
10	178.56	4.96	4.01	2.41
15	142.89	3.97	3.02	2.72
20	119.95	3.33	2.38	2.86
25	103.85	2.89	1.94	2.91
30	91.87	2.55	1.60	2.89
35	82.58	2.30	1.35	2.83
40	75.15	2.09	1.14	2.73
45	69.05	1.92	0.97	2.62
50	63.95	1.78	0.83	2.48
55	59.62	1.66	0.71	2.33
60	55.89	1.55	0.60	2.17
65	52.65	1.46	0.51	2.00
70	49.79	1.38	0.43	1.82
75	47.26	1.31	0.36	1.64
90	41.11	1.14	0.19	1.04
105	36.50	1.01	0.06	0.41
120	32.89	0.91	-0.04	-0.26

Watts Accutrol Flow Control Roof Drains:		RD-100-A-ADJ set to 1/2 Exposed			
Design Event	**Flow/Drain (L/s)**	**Total Flow (L/s)**	**Ponding (cm)**	**Storage (m^3) Required**	**Provided**
1:5 Year	0.79	0.79	6	1.2	7.7
1:100 Year	0.95	0.95	10	2.9	7.7

Roof Drain Storage Table for Area R-1

Elevation	Area RD 2	Total Volume
m	m^2	m^3
0.00	0	0
0.05	30.13	0.8
0.10	77.4	3.4
0.15	93.11	7.7

Stage Storage Curve: Area R-1
Controlled Roof Drain #2



Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA R-1 **Controlled Roof Drain 3**

OTTAWA IDF CURVE

Area =	0.017	ha	Qallow =	0.79	L/s
C =	0.90		Vol(max) =	2.7	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	6.00	5.21	1.56
10	104.19	4.43	3.64	2.19
15	83.56	3.55	2.76	2.49
20	70.25	2.99	2.20	2.64
25	60.90	2.59	1.80	2.70
30	53.93	2.29	1.50	2.71
35	48.52	2.06	1.27	2.67
40	44.18	1.88	1.09	2.61
45	40.63	1.73	0.94	2.53
50	37.65	1.60	0.81	2.43
55	35.12	1.49	0.70	2.32
60	32.94	1.40	0.61	2.20
65	31.04	1.32	0.53	2.07
70	29.37	1.25	0.46	1.93
75	27.89	1.19	0.40	1.78
90	24.29	1.03	0.24	1.31
105	21.58	0.92	0.13	0.81
120	19.47	0.83	0.04	0.27

Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA R-1 **Controlled Roof Drain 3**

OTTAWA IDF CURVE

Area =	0.017	ha	Qallow =	1.10	L/s
C =	1.00		Vol(max) =	5.9	m3

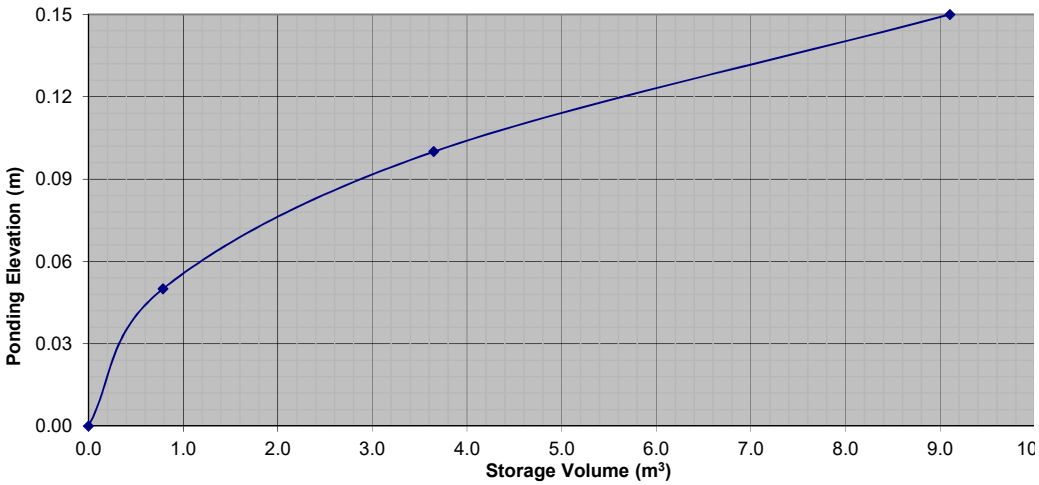
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	11.47	10.37	3.11
10	178.56	8.44	7.34	4.40
15	142.89	6.75	5.65	5.09
20	119.95	5.67	4.57	5.48
25	103.85	4.91	3.81	5.71
30	91.87	4.34	3.24	5.84
35	82.58	3.90	2.80	5.89
40	75.15	3.55	2.45	5.88
45	69.05	3.26	2.16	5.84
50	63.95	3.02	1.92	5.77
55	59.62	2.82	1.72	5.67
60	55.89	2.64	1.54	5.55
65	52.65	2.49	1.39	5.41
70	49.79	2.35	1.25	5.26
75	47.26	2.23	1.13	5.10
90	41.11	1.94	0.84	4.55
105	36.50	1.72	0.62	3.94
120	32.89	1.55	0.45	3.27

Watts Accutrol Flow Control Roof Drains:		RD-100-A-ADJ set to 1/2 Exposed			
Design Event	**Flow/Drain (L/s)**	**Total Flow (L/s)**	**Ponding (cm)**	**Storage (m^3) Required**	**Provided**
1:5 Year	0.79	0.79	9	2.7	9.1
1:100 Year	1.10	1.10	13	5.9	9.1

Roof Drain Storage Table for Area R-1

Elevation	Area RD 3	Total Volume
m	m^2	m^3
0.00	0	0
0.05	31.47	0.8
0.10	83.02	3.6
0.15	135.03	9.1

Stage Storage Curve: Area R-1
Controlled Roof Drain #3



Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA R-1 **Controlled Roof Drain 4**

OTTAWA IDF CURVE

Area =	0.019	ha	Qallow =	0.79	L/s
C =	0.90		Vol(max) =	3.1	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	6.57	5.78	1.73
10	104.19	4.85	4.06	2.44
15	83.56	3.89	3.10	2.79
20	70.25	3.27	2.48	2.98
25	60.90	2.83	2.04	3.07
30	53.93	2.51	1.72	3.10
35	48.52	2.26	1.47	3.08
40	44.18	2.06	1.27	3.04
45	40.63	1.89	1.10	2.97
50	37.65	1.75	0.96	2.89
55	35.12	1.63	0.84	2.79
60	32.94	1.53	0.74	2.68
65	31.04	1.44	0.65	2.55
70	29.37	1.37	0.58	2.42
75	27.89	1.30	0.51	2.29
90	24.29	1.13	0.34	1.84
105	21.58	1.00	0.21	1.35
120	19.47	0.91	0.12	0.83

Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA R-1 **Controlled Roof Drain 4**

OTTAWA IDF CURVE

Area =	0.019	ha	Qallow =	1.10	L/s
C =	1.00		Vol(max) =	6.7	m3

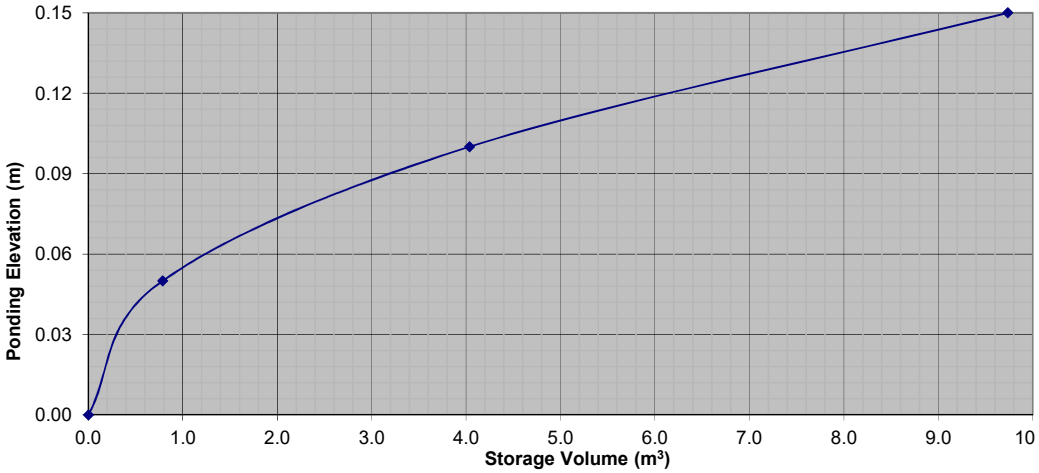
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	12.55	11.45	3.43
10	178.56	9.23	8.13	4.88
15	142.89	7.39	6.29	5.66
20	119.95	6.20	5.10	6.12
25	103.85	5.37	4.27	6.40
30	91.87	4.75	3.65	6.57
35	82.58	4.27	3.17	6.66
40	75.15	3.89	2.79	6.69
45	69.05	3.57	2.47	6.67
50	63.95	3.31	2.21	6.62
55	59.62	3.08	1.98	6.54
60	55.89	2.89	1.79	6.44
65	52.65	2.72	1.62	6.33
70	49.79	2.57	1.47	6.19
75	47.26	2.44	1.34	6.05
90	41.11	2.13	1.03	5.54
105	36.50	1.89	0.79	4.96
120	32.89	1.70	0.60	4.33

Watts Accutrol Flow Control Roof Drains:		RD-100-A-ADJ set to 1/2 Exposed			
Design Event	**Flow/Drain (L/s)**	**Total Flow (L/s)**	**Ponding (cm)**	**Storage (m^3) Required**	**Provided**
1:5 Year	0.79	0.79	9	3.1	9.7
1:100 Year	1.10	1.10	13	6.7	9.7

Roof Drain Storage Table for Area R-1

Elevation	Area RD 4	Total Volume
m	m^2	m^3
0.00	0	0
0.05	31.47	0.8
0.10	98.49	4.0
0.15	129.52	9.7

Stage Storage Curve: Area R-1
Controlled Roof Drain #4



Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA R-1 **Controlled Roof Drain 5**

OTTAWA IDF CURVE

Area =	0.033	ha	Qallow =	1.10	L/s
C =	0.90		Vol(max) =	6.1	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	11.66	10.56	3.17
10	104.19	8.60	7.50	4.50
15	83.56	6.90	5.80	5.22
20	70.25	5.80	4.70	5.64
25	60.90	5.03	3.93	5.89
30	53.93	4.45	3.35	6.03
35	48.52	4.01	2.91	6.10
40	44.18	3.65	2.55	6.12
45	40.63	3.35	2.25	6.09
50	37.65	3.11	2.01	6.03
55	35.12	2.90	1.80	5.94
60	32.94	2.72	1.62	5.83
65	31.04	2.56	1.46	5.71
70	29.37	2.43	1.33	5.57
75	27.89	2.30	1.20	5.41
90	24.29	2.01	0.91	4.89
105	21.58	1.78	0.68	4.30
120	19.47	1.61	0.51	3.65

Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA R-1 **Controlled Roof Drain 5**

OTTAWA IDF CURVE

Area =	0.033	ha	Qallow =	1.58	L/s
C =	1.00		Vol(max) =	12.9	m3

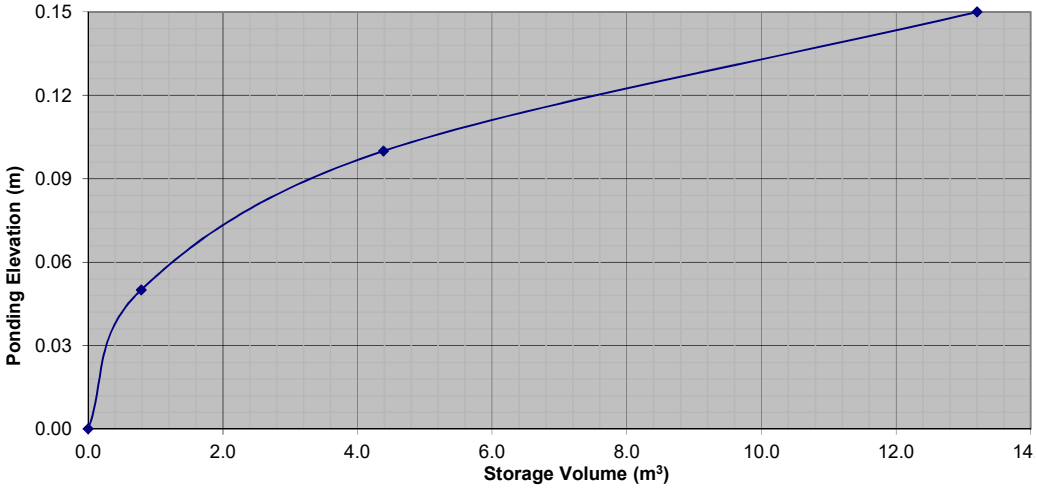
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	22.27	20.69	6.21
10	178.56	16.38	14.80	8.88
15	142.89	13.11	11.53	10.38
20	119.95	11.00	9.42	11.31
25	103.85	9.53	7.95	11.92
30	91.87	8.43	6.85	12.33
35	82.58	7.58	6.00	12.59
40	75.15	6.89	5.31	12.75
45	69.05	6.33	4.75	12.84
50	63.95	5.87	4.29	12.86
55	59.62	5.47	3.89	12.84
60	55.89	5.13	3.55	12.77
65	52.65	4.83	3.25	12.67
70	49.79	4.57	2.99	12.55
75	47.26	4.34	2.76	12.40
90	41.11	3.77	2.19	11.83
105	36.50	3.35	1.77	11.14
120	32.89	3.02	1.44	10.35

Watts Accutrol Flow Control Roof Drains:		RD-100-A-ADJ set to 3/4 Exposed			
Design Event	**Flow/Drain (L/s)**	**Total Flow (L/s)**	**Ponding (cm)**	**Storage (m^3) Required**	**Provided**
1:5 Year	1.10	1.10	11	6.1	13.2
1:100 Year	1.58	1.58	15	12.9	13.2

Roof Drain Storage Table for Area R-1

Elevation	Area RD 5	Total Volume
m	m^2	m^3
0.00	0	0
0.05	31.47	0.8
0.10	112.57	4.4
0.15	240.08	13.2

Stage Storage Curve: Area R-1
Controlled Roof Drain #5



Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA R-1 **Controlled Roof Drain 6**

OTTAWA IDF CURVE

Area =	0.034	ha	Qallow =	1.10	L/s
C =	0.90		Vol(max) =	6.3	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	11.90	10.80	3.24
10	104.19	8.79	7.69	4.61
15	83.56	7.05	5.95	5.35
20	70.25	5.92	4.82	5.79
25	60.90	5.13	4.03	6.05
30	53.93	4.55	3.45	6.20
35	48.52	4.09	2.99	6.28
40	44.18	3.73	2.63	6.30
45	40.63	3.43	2.33	6.28
50	37.65	3.17	2.07	6.22
55	35.12	2.96	1.86	6.14
60	32.94	2.78	1.68	6.04
65	31.04	2.62	1.52	5.92
70	29.37	2.48	1.38	5.78
75	27.89	2.35	1.25	5.63
90	24.29	2.05	0.95	5.12
105	21.58	1.82	0.72	4.53
120	19.47	1.64	0.54	3.90

Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA R-1 **Controlled Roof Drain 6**

OTTAWA IDF CURVE

Area =	0.034	ha	Qallow =	1.58	L/s
C =	1.00		Vol(max) =	13.2	m3

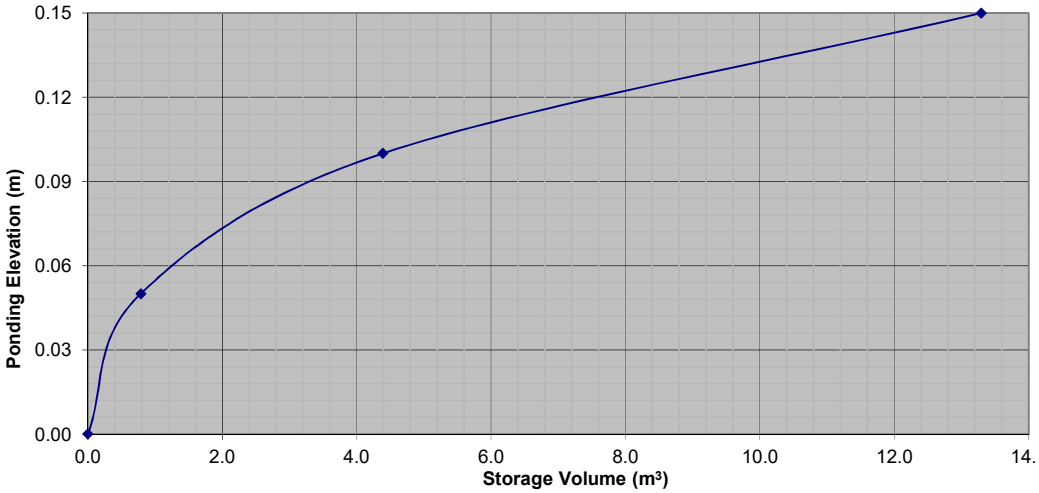
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	22.74	21.16	6.35
10	178.56	16.73	15.15	9.09
15	142.89	13.39	11.81	10.63
20	119.95	11.24	9.66	11.59
25	103.85	9.73	8.15	12.22
30	91.87	8.61	7.03	12.65
35	82.58	7.74	6.16	12.93
40	75.15	7.04	5.46	13.10
45	69.05	6.47	4.89	13.20
50	63.95	5.99	4.41	13.23
55	59.62	5.59	4.01	13.22
60	55.89	5.24	3.66	13.16
65	52.65	4.93	3.35	13.07
70	49.79	4.66	3.08	12.96
75	47.26	4.43	2.85	12.81
90	41.11	3.85	2.27	12.27
105	36.50	3.42	1.84	11.59
120	32.89	3.08	1.50	10.81

Watts Accutrol Flow Control Roof Drains:		RD-100-A-ADJ set to 3/4 Exposed			
Design Event	**Flow/Drain (L/s)**	**Total Flow (L/s)**	**Ponding (cm)**	**Storage (m^3) Required**	**Provided**
1:5 Year	1.10	1.10	11	6.3	13.3
1:100 Year	1.58	1.58	15	13.2	13.3

Roof Drain Storage Table for Area R-1

Elevation	Area RD 6	Total Volume
m	m^2	m^3
0.00	0	0
0.05	31.47	0.8
0.10	112.57	4.4
0.15	243.67	13.3

Stage Storage Curve: Area R-1
Controlled Roof Drain #6



Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA R-1 **Controlled Roof Drain 7**

OTTAWA IDF CURVE

Area =	0.034	ha	Qallow =	1.10	L/s
C =	0.90		Vol(max) =	6.3	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	11.90	10.80	3.24
10	104.19	8.79	7.69	4.61
15	83.56	7.05	5.95	5.35
20	70.25	5.92	4.82	5.79
25	60.90	5.13	4.03	6.05
30	53.93	4.55	3.45	6.20
35	48.52	4.09	2.99	6.28
40	44.18	3.73	2.63	6.30
45	40.63	3.43	2.33	6.28
50	37.65	3.17	2.07	6.22
55	35.12	2.96	1.86	6.14
60	32.94	2.78	1.68	6.04
65	31.04	2.62	1.52	5.92
70	29.37	2.48	1.38	5.78
75	27.89	2.35	1.25	5.63
90	24.29	2.05	0.95	5.12
105	21.58	1.82	0.72	4.53
120	19.47	1.64	0.54	3.90

Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA R-1 **Controlled Roof Drain 7**

OTTAWA IDF CURVE

Area =	0.034	ha	Qallow =	1.58	L/s
C =	1.00		Vol(max) =	13.2	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	22.74	21.16	6.35
10	178.56	16.73	15.15	9.09
15	142.89	13.39	11.81	10.63
20	119.95	11.24	9.66	11.59
25	103.85	9.73	8.15	12.22
30	91.87	8.61	7.03	12.65
35	82.58	7.74	6.16	12.93
40	75.15	7.04	5.46	13.10
45	69.05	6.47	4.89	13.20
50	63.95	5.99	4.41	13.23
55	59.62	5.59	4.01	13.22
60	55.89	5.24	3.66	13.16
65	52.65	4.93	3.35	13.07
70	49.79	4.66	3.08	12.96
75	47.26	4.43	2.85	12.81
90	41.11	3.85	2.27	12.27
105	36.50	3.42	1.84	11.59
120	32.89	3.08	1.50	10.81

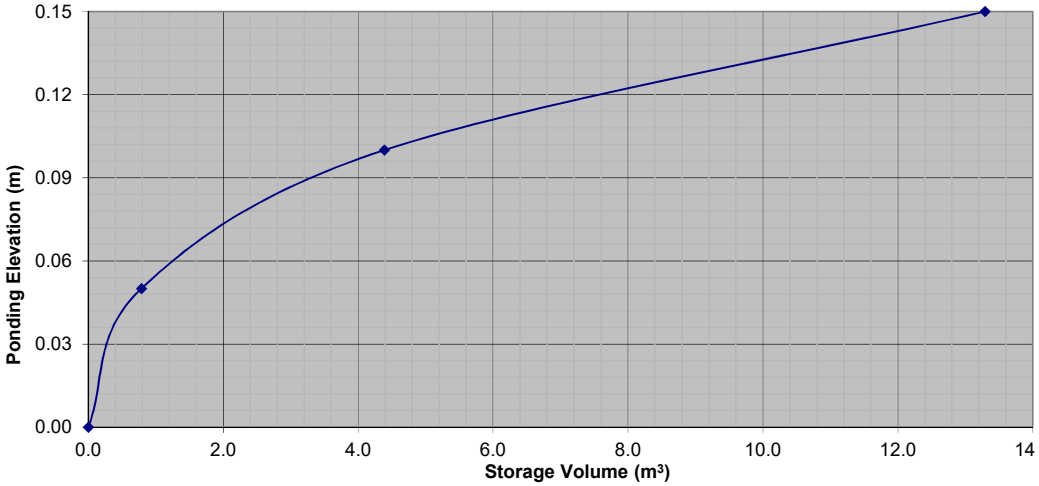
Watts Accutrol Flow Control Roof Drains: RD-100-A-ADJ set to 3/4 Exposed

Design Event	Flow/Drain (L/s)	Total Flow (L/s)	Ponding (cm)	Storage (m^3) Required	Storage (m^3) Provided
1:5 Year	1.10	1.10	11	6.3	13.3
1:100 Year	1.58	1.58	15	13.2	13.3

Roof Drain Storage Table for Area R-1

Elevation	Area RD 7	Total Volume
m	m^2	m^3
0.00	0	0
0.05	31.47	0.8
0.10	112.57	4.4
0.15	243.67	13.3

Stage Storage Curve: Area R-1
Controlled Roof Drain #7



Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA R-1 **Controlled Roof Drain 8**

OTTAWA IDF CURVE

Area =	0.034	ha	Qallow =	1.10	L/s
C =	0.90		Vol(max) =	6.3	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	11.90	10.80	3.24
10	104.19	8.79	7.69	4.61
15	83.56	7.05	5.95	5.35
20	70.25	5.92	4.82	5.79
25	60.90	5.13	4.03	6.05
30	53.93	4.55	3.45	6.20
35	48.52	4.09	2.99	6.28
40	44.18	3.73	2.63	6.30
45	40.63	3.43	2.33	6.28
50	37.65	3.17	2.07	6.22
55	35.12	2.96	1.86	6.14
60	32.94	2.78	1.68	6.04
65	31.04	2.62	1.52	5.92
70	29.37	2.48	1.38	5.78
75	27.89	2.35	1.25	5.63
90	24.29	2.05	0.95	5.12
105	21.58	1.82	0.72	4.53
120	19.47	1.64	0.54	3.90

Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA R-1 **Controlled Roof Drain 8**

OTTAWA IDF CURVE

Area =	0.034	ha	Qallow =	1.58	L/s
C =	1.00		Vol(max) =	13.2	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	22.74	21.16	6.35
10	178.56	16.73	15.15	9.09
15	142.89	13.39	11.81	10.63
20	119.95	11.24	9.66	11.59
25	103.85	9.73	8.15	12.22
30	91.87	8.61	7.03	12.65
35	82.58	7.74	6.16	12.93
40	75.15	7.04	5.46	13.10
45	69.05	6.47	4.89	13.20
50	63.95	5.99	4.41	13.23
55	59.62	5.59	4.01	13.22
60	55.89	5.24	3.66	13.16
65	52.65	4.93	3.35	13.07
70	49.79	4.66	3.08	12.96
75	47.26	4.43	2.85	12.81
90	41.11	3.85	2.27	12.27
105	36.50	3.42	1.84	11.59
120	32.89	3.08	1.50	10.81

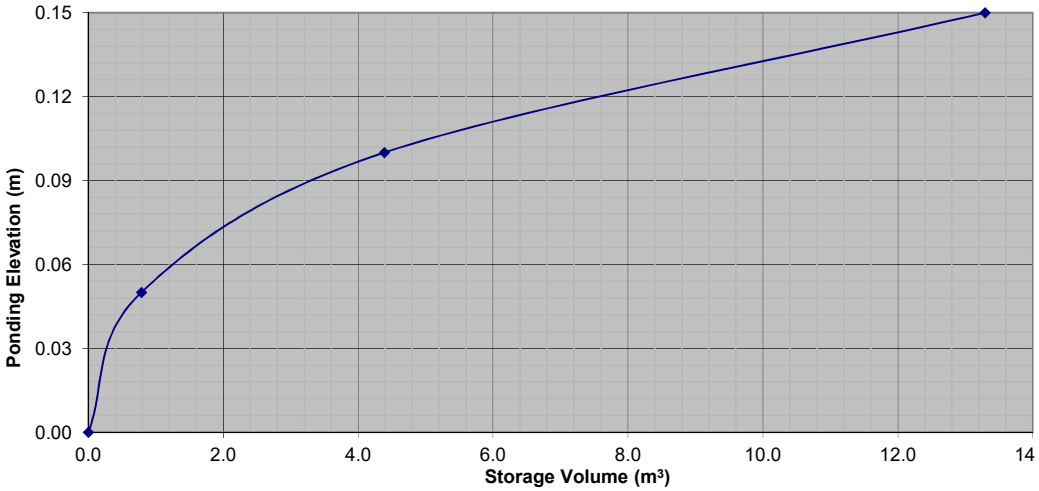
Watts Accutrol Flow Control Roof Drains: RD-100-A-ADJ set to 3/4 Exposed

Design Event	Flow/Drain (L/s)	Total Flow (L/s)	Ponding (cm)	Storage (m^3) Required	Storage (m^3) Provided
1:5 Year	1.10	1.10	11	6.3	13.3
1:100 Year	1.58	1.58	15	13.2	13.3

Roof Drain Storage Table for Area R-1

Elevation	Area RD 8	Total Volume
m	m^2	m^3
0.00	0	0
0.05	31.47	0.8
0.10	112.57	4.4
0.15	243.67	13.3

Stage Storage Curve: Area R-1
Controlled Roof Drain #8



Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA R-1 **Controlled Roof Drain 9**

OTTAWA IDF CURVE

Area =	0.026	ha	Qallow =	0.95	L/s
C =	0.90		Vol(max) =	4.6	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	9.18	8.23	2.47
10	104.19	6.78	5.83	3.50
15	83.56	5.44	4.49	4.04
20	70.25	4.57	3.62	4.34
25	60.90	3.96	3.01	4.52
30	53.93	3.51	2.56	4.60
35	48.52	3.16	2.21	4.63
40	44.18	2.87	1.92	4.62
45	40.63	2.64	1.69	4.57
50	37.65	2.45	1.50	4.50
55	35.12	2.28	1.33	4.40
60	32.94	2.14	1.19	4.29
65	31.04	2.02	1.07	4.17
70	29.37	1.91	0.96	4.03
75	27.89	1.81	0.86	3.89
90	24.29	1.58	0.63	3.40
105	21.58	1.40	0.45	2.86
120	19.47	1.27	0.32	2.28

Heritage Hills Retail Plaza - 471 Terry Fox
Project No.: 118133
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA R-1 **Controlled Roof Drain 9**

OTTAWA IDF CURVE

Area =	0.026	ha	Qallow =	1.26	L/s
C =	1.00		Vol(max) =	10.1	m3

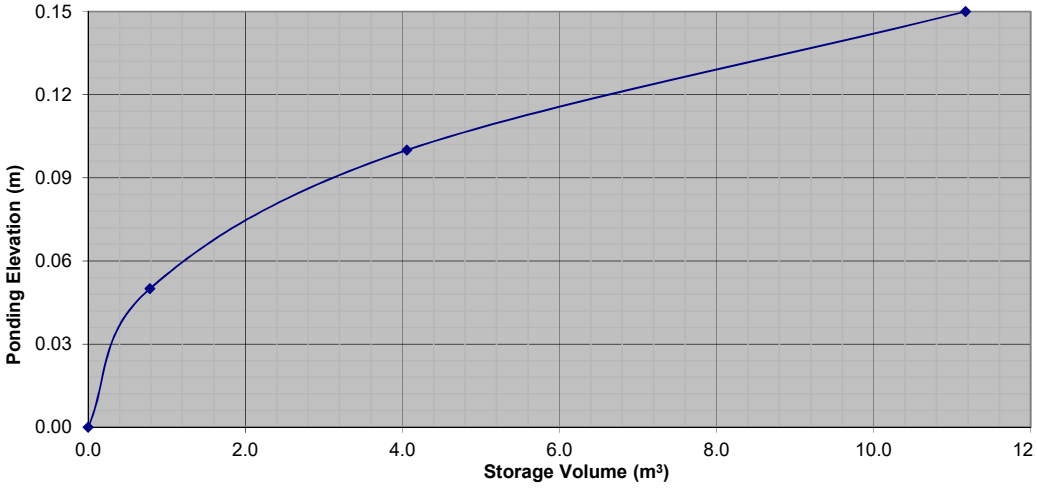
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	17.54	16.28	4.88
10	178.56	12.91	11.65	6.99
15	142.89	10.33	9.07	8.16
20	119.95	8.67	7.41	8.89
25	103.85	7.51	6.25	9.37
30	91.87	6.64	5.38	9.68
35	82.58	5.97	4.71	9.89
40	75.15	5.43	4.17	10.01
45	69.05	4.99	3.73	10.07
50	63.95	4.62	3.36	10.09
55	59.62	4.31	3.05	10.06
60	55.89	4.04	2.78	10.01
65	52.65	3.81	2.55	9.93
70	49.79	3.60	2.34	9.82
75	47.26	3.42	2.16	9.70
90	41.11	2.97	1.71	9.24
105	36.50	2.64	1.38	8.68
120	32.89	2.38	1.12	8.05

Watts Accutrol Flow Control Roof Drains:		RD-100-A-ADJ set to 1/2 Exposed			
Design Event	**Flow/Drain (L/s)**	**Total Flow (L/s)**	**Ponding (cm)**	**Storage (m^3) Required**	**Provided**
1:5 Year	0.95	0.95	10	4.6	11.2
1:100 Year	1.26	1.26	14	10.1	11.2

Roof Drain Storage Table for Area R-1

Elevation	Area RD 9	Total Volume
m	m^2	m^3
0.00	0	0
0.05	31.47	0.8
0.10	99.32	4.1
0.15	185.15	11.2

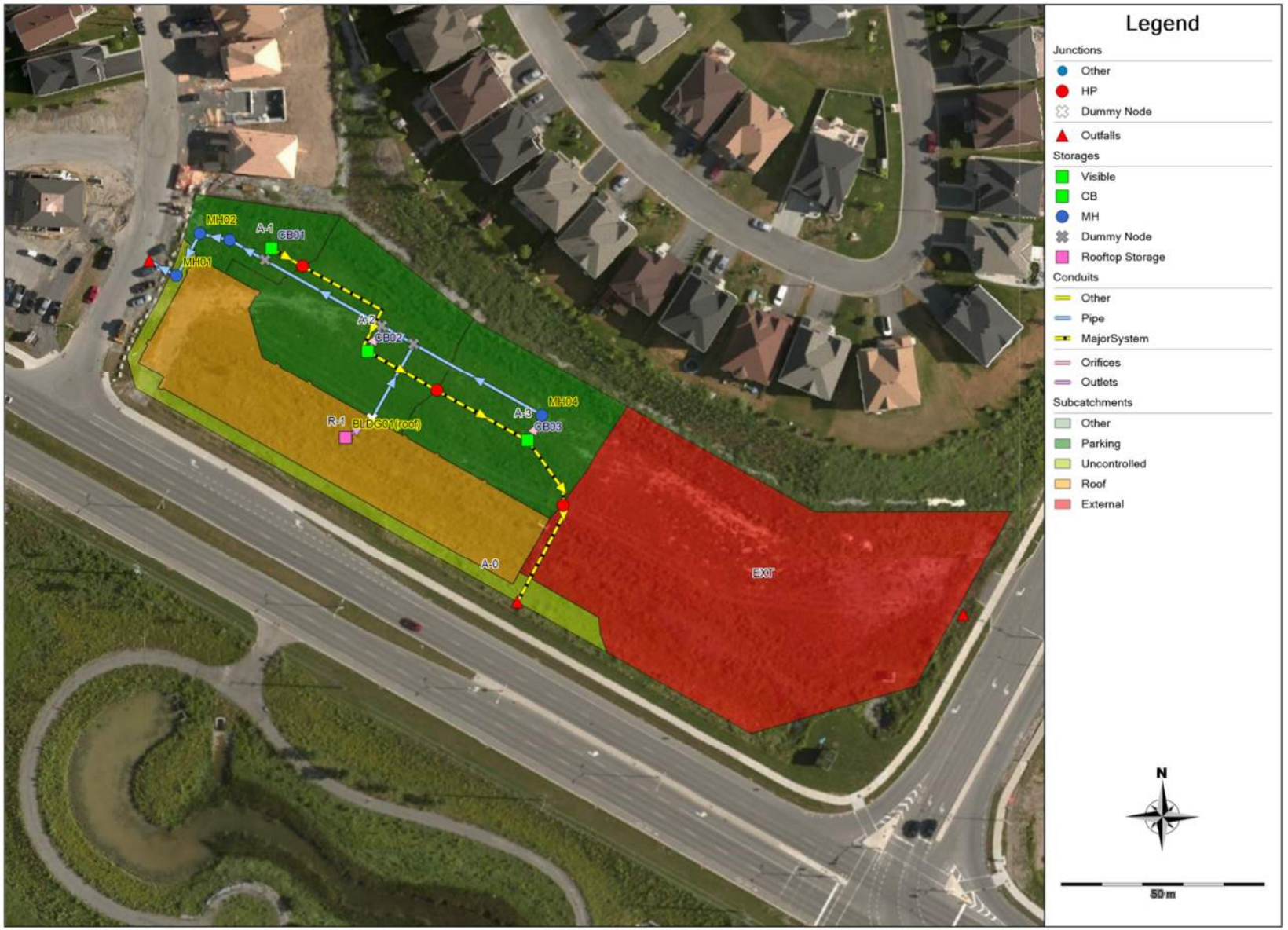
Stage Storage Curve: Area R-1
Controlled Roof Drain #9



Heritage Hills Retail Plaza (471 Terry Fox Drive)
PCSWMM Model Schematic

NOVATECH
Engineers, Planners & Landscape Architects

Overall Model Schematic



Date: 2019-01-24
M:\2018\118133\DATA\Calculations\SWM\PCSWMM\Model Schematic-Output\PCSWMM Model Schematic.docx

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
-------------------------------------------------------------

Allowable Release Rate = 141.9 L/s
MH202 (100yr HGL) = 96.14m
MH202 (OBV) = 95.28m


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 6
Number of nodes ........... 18
Number of links ........... 18
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
------------------------------------------------------------------------
Raingage             C4hr-100yr                   INTENSITY   10 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
------------------------------------------------------------------------------------------
A-0                         0.06    200.00     65.70    2.0000 Raingage             Major-Out
A-1                         0.05     72.00     62.90    2.0000 Raingage             CB01
A-2                         0.17    111.33     88.60    2.0000 Raingage             CB02
A-3                         0.14     94.67     98.60    2.0000 Raingage             CB03
EXT                         0.53    105.40     85.70    2.0000 Raingage             EXT-Out
R-1                         0.23    226.00    100.00    1.5000 Raingage             BLDG01(roof)


************
Node Summary
************
                                     Invert      Max.    Ponded    External

Name                 Type                 Elev.     Depth      Area    Inflow
------------------------------------------------------------------------------
BLDG01               JUNCTION            95.30      5.70       0.0
HP01                 JUNCTION            96.65      1.00       0.0
HP02                 JUNCTION            96.63      1.00       0.0
HP03                 JUNCTION            96.61      1.00       0.0
EXMH202              OUTFALL             94.65      0.45       0.0
EXT-Out              OUTFALL             96.00      0.00       0.0
Major-Out            OUTFALL             96.10      1.00       0.0
BLDG01(roof)         STORAGE            100.00      1.00       0.0
CB01                 STORAGE             95.00      2.45       0.0
CB02                 STORAGE             95.06      2.34       0.0
CB03                 STORAGE             95.22      2.18       0.0
MH01                 STORAGE             94.73      2.12       0.0
MH02                 STORAGE             94.78      2.27       0.0
MH03                 STORAGE             94.83      2.02       0.0
MH04                 STORAGE             95.04      1.83       0.0
MH04(D1)             STORAGE             94.88      1.82       0.0
MH04(D2)             STORAGE             94.95      1.90       0.0
MH04(D3)             STORAGE             94.97      1.93       0.0


************
Link Summary
************
Name              From Node        To Node          Type            Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C1                CB01             HP01             CONDUIT            3.0   -6.6815    0.0150
C16               MH03             MH02             CONDUIT            7.5    0.2667    0.0130
C18_2             MH04(D1)         MH03             CONDUIT           10.0    0.2000    0.0130
C18_5             MH04(D2)         MH04(D1)         CONDUIT           33.0    0.2121    0.0130
C18_6             MH04(D3)         MH04(D2)         CONDUIT            9.0    0.2222    0.0130
C18_7             MH04             MH04(D3)         CONDUIT           36.1    0.1939    0.0130
C2                HP01             CB02             CONDUIT            3.0    8.3624    0.0150
C21               BLDG01           MH04(D3)         CONDUIT           20.1    1.6420    0.0130
C26               MH01             EXMH202          CONDUIT            7.5    1.0667    0.0130
C27               MH02             MH01             CONDUIT           11.8    0.1695    0.0130
C3                CB02             HP02             CONDUIT            3.0   -7.6893    0.0150
C4                HP02             CB03             CONDUIT            3.0    7.6893    0.0150
C6                HP03             Major-Out        CONDUIT           30.0    1.7002    0.0150
C7                CB03             HP03             CONDUIT            3.0   -7.0172    0.0150
CB01-ICD          CB01             MH04(D1)         ORIFICE
CB02-ICD          CB02             MH04(D2)         ORIFICE
CB03-ICD          CB03             MH04             ORIFICE
BLDG01(drain)     BLDG01(roof)     BLDG01           OUTLET
```

```
*********************
Cross Section Summary
*********************
                                    Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape             Depth     Area     Rad.    Width  Barrels     Flow
-------------------------------------------------------------------------------------
C1               RECT_OPEN          1.00     3.00     0.60     3.00        1 36778.58
C16              CIRCULAR           0.45     0.16     0.11     0.45        1   147.24
C18_2            CIRCULAR           0.45     0.16     0.11     0.45        1   127.51
C18_5            CIRCULAR           0.45     0.16     0.11     0.45        1   131.32
C18_6            CIRCULAR           0.45     0.16     0.11     0.45        1   134.41
C18_7            CIRCULAR           0.45     0.16     0.11     0.45        1   125.55
C2               RECT_OPEN          1.00     3.00     0.60     3.00        1 41145.56
C21              CIRCULAR           0.20     0.03     0.05     0.20        1    42.03
C26              CIRCULAR           0.45     0.16     0.11     0.45        1   294.48
C27              CIRCULAR           0.45     0.16     0.11     0.45        1   117.38
C3               RECT_OPEN          1.00     3.00     0.60     3.00        1 39454.84
C4               RECT_OPEN          1.00     3.00     0.60     3.00        1 39454.84
C6               RECT_OPEN          1.00     3.00     0.60     3.00        1 18552.94
C7               RECT_OPEN          1.00     3.00     0.60     3.00        1 37691.14


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

***************
Analysis Options
***************
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Starting Date ..... 12/07/2018 00:00:00
Ending Date ..... 12/14/2018 00:00:00
```

```
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:05:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 2.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 4
Head Tolerance ..... 0.001500 m

*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Initial LID Storage .....         0.001         1.085
Total Precipitation .....         0.090        76.002
Evaporation Loss .........        0.000         0.000
Infiltration Loss ........        0.007         5.536
Surface Runoff ...........        0.084        71.044
Final Storage ............        0.001         1.085
Continuity Error (%) .....       -0.750

*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .......        0.000         0.000
Wet Weather Inflow .......        0.084         0.838
Groundwater Inflow .......        0.000         0.000
RDII Inflow ..............        0.000         0.000
External Inflow ..........        0.000         0.000
External Outflow .........        0.084         0.838
Flooding Loss ............        0.000         0.000
Evaporation Loss .........        0.000         0.000
Exfiltration Loss ........        0.000         0.000
Initial Stored Volume ....        0.003         0.029
Final Stored Volume ......        0.003         0.029
Continuity Error (%) .....        0.000


**************************
Time-Step Critical Elements
**************************
None
```

```
*******************************
Highest Flow Instability Indexes
*******************************
Link CB03-ICD (146)
Link CB02-ICD (146)
Link C21 (10)
Link CB01-ICD (1)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.50 sec
Average Time Step           :     2.00 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00


***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A-0	76.00	0.00	0.00	16.06	61.45	0.04	30.28	0.809
A-1	76.00	0.00	0.00	17.44	59.86	0.03	25.36	0.788
A-2	76.00	0.00	0.00	5.35	71.23	0.12	81.55	0.937
A-3	76.00	0.00	0.00	0.65	75.56	0.11	70.30	0.994
EXT	76.00	0.00	0.00	6.79	69.91	0.37	252.98	0.920
R-1	76.00	0.00	0.00	0.00	76.11	0.17	112.10	1.001

```
******************
Node Depth Summary
******************
```

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
BLDG01	JUNCTION	0.84	0.96	96.26	0 01:42	0.96
HP01	JUNCTION	0.00	0.00	96.65	0 00:00	0.00
HP02	JUNCTION	0.00	0.01	96.64	0 01:32	0.01
HP03	JUNCTION	0.00	0.00	96.61	0 00:00	0.00
EXMH202	OUTFALL	1.49	1.49	96.14	0 00:00	1.49
EXT-Out	OUTFALL	0.00	0.00	96.00	0 00:00	0.00
Major-Out	OUTFALL	0.00	0.00	96.10	0 00:00	0.00
BLDG01(roof)	STORAGE	0.00	0.15	100.15	0 01:54	0.15
CB01	STORAGE	1.14	1.65	96.65	0 01:42	1.65
CB02	STORAGE	1.08	1.58	96.64	0 01:32	1.58
CB03	STORAGE	0.92	1.39	96.61	0 01:34	1.39
MH01	STORAGE	1.41	1.43	96.16	0 01:35	1.43
MH02	STORAGE	1.36	1.40	96.18	0 01:35	1.40
MH03	STORAGE	1.31	1.36	96.19	0 01:35	1.36
MH04	STORAGE	1.10	1.19	96.23	0 01:35	1.19
MH04(D1)	STORAGE	1.26	1.32	96.20	0 01:35	1.32
MH04(D2)	STORAGE	1.19	1.27	96.22	0 01:35	1.27
MH04(D3)	STORAGE	1.17	1.25	96.22	0 01:35	1.25

```
******************
Node Inflow Summary
******************
```

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
BLDG01	JUNCTION	0.00	12.49	0 01:54	0	0.174	-0.000	
HP01	JUNCTION	0.00	0.00	0 00:00	0	0	0.000	ltr
HP02	JUNCTION	0.00	27.72	0 01:32	0	0.00499	-0.014	
HP03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000	ltr
EXMH202	OUTFALL	0.00	71.83	0 01:36	0	0.501	0.000	
EXT-Out	OUTFALL	252.98	252.98	0 01:30	0.368	0.368	0.000	
Major-Out	OUTFALL	30.28	30.28	0 01:30	0.0393	0.0393	0.000	
BLDG01(roof)	STORAGE	112.10	112.10	0 01:30	0.172	0.172	-0.001	
CB01	STORAGE	25.36	25.36	0 01:30	0.0323	0.0345	-0.011	
CB02	STORAGE	81.55	81.55	0 01:30	0.119	0.128	0.100	
CB03	STORAGE	70.30	70.30	0 01:30	0.107	0.121	0.193	
MH01	STORAGE	0.00	71.83	0 01:36	0	0.501	0.000	
MH02	STORAGE	0.00	71.83	0 01:36	0	0.499	0.000	
MH03	STORAGE	0.00	71.83	0 01:36	0	0.495	0.000	
MH04	STORAGE	0.00	33.48	0 01:34	0	0.133	-0.163	
MH04(D1)	STORAGE	0.00	71.83	0 01:36	0	0.491	0.001	

MH04(D2)	STORAGE	0.00	66.76	0	01:35	0	0.453	-0.026
MH04(D3)	STORAGE	0.00	45.41	0	01:36	0	0.317	0.001

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
BLDG01	JUNCTION	168.00	0.761	4.739

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
BLDG01(roof)	0.001	1	0	0	0.097	90	0 01:54	12.49
CB01	0.000	3	0	0	0.012	92	0 01:42	5.24
CB02	0.001	2	0	0	0.033	100	0 01:32	49.30
CB03	0.000	2	0	0	0.022	90	0 01:34	33.48
MH01	0.001	67	0	0	0.001	67	0 01:35	71.83
MH02	0.001	60	0	0	0.001	62	0 01:35	71.83
MH03	0.001	65	0	0	0.001	68	0 01:35	71.83
MH04	0.001	60	0	0	0.001	65	0 01:35	33.47
MH04(D1)	0.001	69	0	0	0.001	73	0 01:35	71.83
MH04(D2)	0.001	63	0	0	0.001	67	0 01:35	66.76
MH04(D3)	0.001	61	0	0	0.001	65	0 01:35	45.41

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
EXMH202	91.75	0.90	71.83	0.501
EXT-Out	3.40	17.89	252.98	0.368
Major-Out	2.43	2.68	30.28	0.039
System	32.53	21.47	351.95	0.908

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.10
C16	CONDUIT	71.83	0 01:36	0.45	0.49	1.00
C18_2	CONDUIT	71.83	0 01:36	0.45	0.56	1.00
C18_5	CONDUIT	66.76	0 01:35	0.42	0.51	1.00
C18_6	CONDUIT	45.41	0 01:37	0.29	0.34	1.00
C18_7	CONDUIT	33.47	0 01:35	0.21	0.27	1.00
C2	CONDUIT	0.00	0 00:00	0.00	0.00	0.12
C21	CONDUIT	12.52	0 01:58	0.40	0.30	1.00
C26	CONDUIT	71.83	0 01:36	0.45	0.24	1.00
C27	CONDUIT	71.83	0 01:36	0.45	0.61	1.00
C3	CONDUIT	27.72	0 01:32	0.07	0.00	0.13
C4	CONDUIT	27.88	0 01:32	0.09	0.00	0.11
C6	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C7	CONDUIT	0.00	0 00:00	0.00	0.00	0.10
CB01-ICD	ORIFICE	5.24	0 01:59			1.00
CB02-ICD	ORIFICE	21.83	0 01:59			1.00
CB03-ICD	ORIFICE	33.48	0 01:34			1.00
BLDG01(drain)	DUMMY	12.49	0 01:54			

****

Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		Fraction of Time in Flow Class								
C1	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C18_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C18_5	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C18_6	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C18_7	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C26	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C27	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00
C4	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00
C6	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C16	168.00	168.00	168.00	0.01	0.01
C18_2	168.00	168.00	168.00	0.01	0.01
C18_5	168.00	168.00	168.00	0.01	0.01
C18_6	168.00	168.00	168.00	0.01	0.01
C18_7	168.00	168.00	168.00	0.01	0.01
C21	168.00	168.00	168.00	0.01	0.01
C26	168.00	168.00	168.00	0.01	0.01
C27	168.00	168.00	168.00	0.01	0.34

Analysis begun on: Thu Jan 24 11:11:35 2019
Analysis ended on: Thu Jan 24 11:11:42 2019
Total elapsed time: 00:00:07

Conrad Stang

From: Rosiu, Cornel <Cornel.Rosiu@ipexna.com>
Sent: Friday, January 25, 2019 9:53 AM
To: Conrad Stang
Cc: Donnelly, Ryan
Subject: RE: Tempest LMF/MHF ICD Design Request (118133)
Attachments: 2019012503 Novatech - Heritage Hills ICD Submittal R1.pdf

Conrad,

Please see attached revised submittal

Regards,

Cornel Rosiu
IPEX Inc. - *Municipal Estimator, ON*
Cornel.Rosiu@ipexna.com
6810 Invader Crescent, Mississauga, ON, L5T 2B6 T: (905) 670-7676 x200

From: Conrad Stang <c.stang@novatech-eng.com>
Sent: January 25, 2019 9:43 AM
To: Rosiu, Cornel <Cornel.Rosiu@ipexna.com>
Cc: Donnelly, Ryan <Ryan.Donnelly@ipexna.com>
Subject: RE: Tempest LMF/MHF ICD Design Request (118133)

Hi Cornel,

As per our discussion, can I please have an updated ICD submittal package with the following head / flow rates:

Location	Structure Size	Outlet Pipe Diameter (mm)	100-year Event *(Normal Outfall)*	
			Head (m)	Peak Flow (L/s)
CB01	600mm x 600mm Square	300	1.61	9.3
CB02	600mm x 600mm Square	300	1.54	39.0
CB03	600mm x 600mm Square	300	1.29	59.4

Thanks,

Conrad

Conrad Stang, M.A.Sc., P.Eng., Project Manager | Water Resources
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x310 | Fax: 613.254.5867
Email: c.stang@novatech-eng.com | Website: www.novatech-eng.com

From: Rosiu, Cornel <Cornel.Rosiu@ipexna.com>
Sent: Thursday, January 24, 2019 12:41 PM
To: Conrad Stang <c.stang@novatech-eng.com>
Cc: Donnelly, Ryan <Ryan.Donnelly@ipexna.com>
Subject: RE: Tempest LMF/MHF ICD Design Request (118133)

Conrad,

Please see attached ICD submittal

Regards,

Cornel Rosiu
IPEX Inc. - *Municipal Estimator, ON*
Cornel.Rosiu@ipexna.com
6810 Invader Crescent, Mississauga, ON, L5T 2B6 T: (905) 670-7676 x200

From: Conrad Stang <c.stang@novatech-eng.com>
Sent: January 24, 2019 11:33 AM
To: Rosiu, Cornel <Cornel.Rosiu@ipexna.com>
Cc: Crozier, Perry <Perry.Crozier@ipexna.com>
Subject: Tempest LMF/MHF ICD Design Request (118133)

Hi Cornel,

Can I please get sizing / documentation for Tempest LMF or MHF ICDs. I would like to size the ICDs based on the 2-year head and flow rates in the table below.

The project name is “Heritage Hills Retail Plaza”. It is a proposed site plan in Ottawa, Ontario.

Novatech Job Number: 118133

Location	Structure Size	Outlet Pipe Diameter (mm)	2-year Event	
			Head (m)	Peak Flow (L/s)
CB01	600mm x 600mm Square	300	0.91	6.7
CB02	600mm x 600mm Square	300	1.06	32.0
CB03	600mm x 600mm Square	300	0.39	30.0

Thanks and let me know if you have any questions.

Kind regards,

Conrad

Conrad Stang, M.A.Sc., P.Eng., Project Manager | Water Resources
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x310 | Fax: 613.254.5867
Email: c.stang@novatech-eng.com | Website: www.novatech-eng.com

TEMPEST Product Submittal Package

Date: January 24, 2019

Customer: Novatech

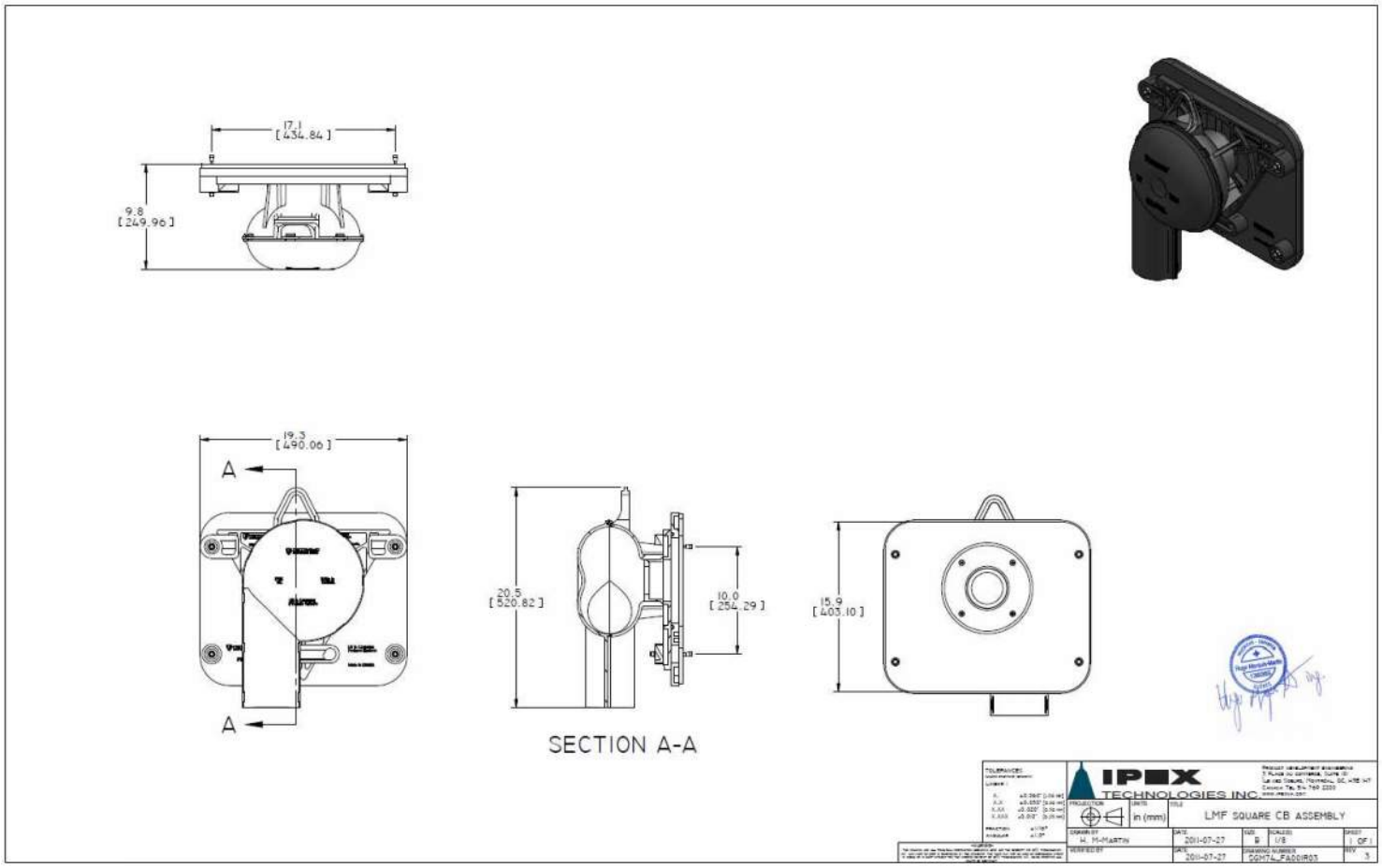
Contact: Conrad Stang

Location: Ottawa

Project Name: Heritage Hills Retail Plaza

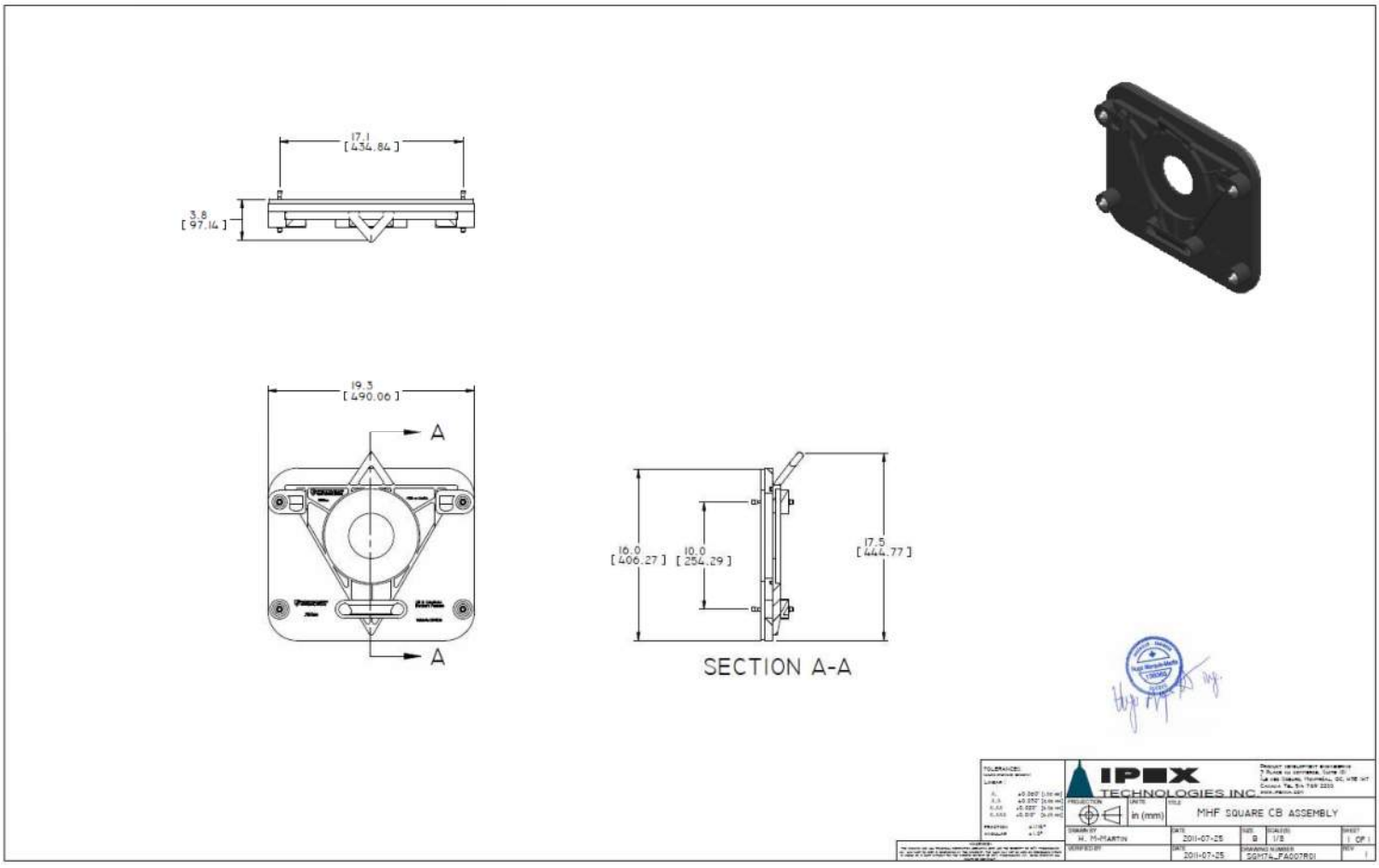
IPEX

<u>Tempest LMF ICD Sq</u> Shop Drawing



IPEX

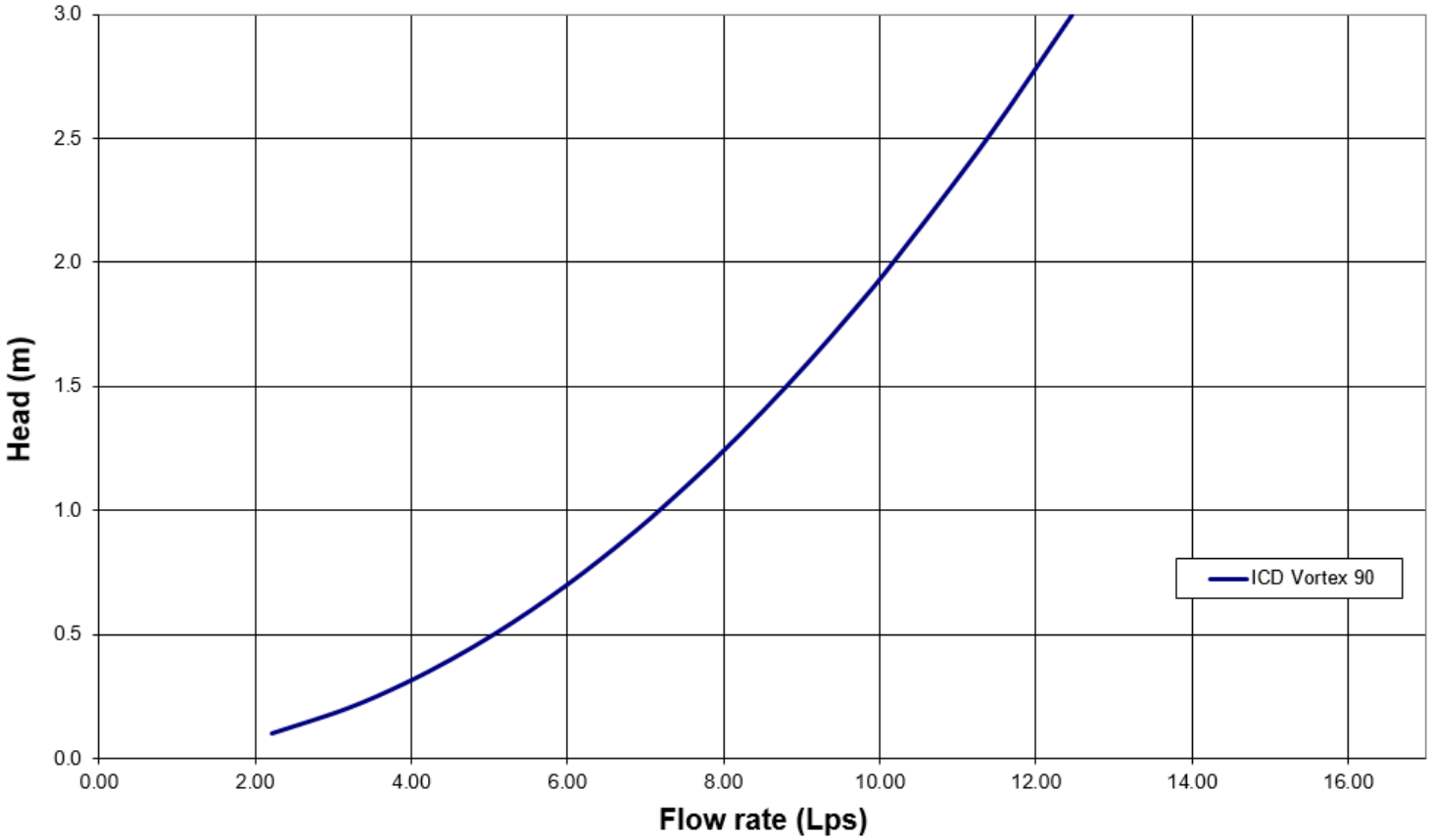
Tempest MHF ICD Sq Shop Drawing



IPEX

Tempest LMF ICD Flow Curve

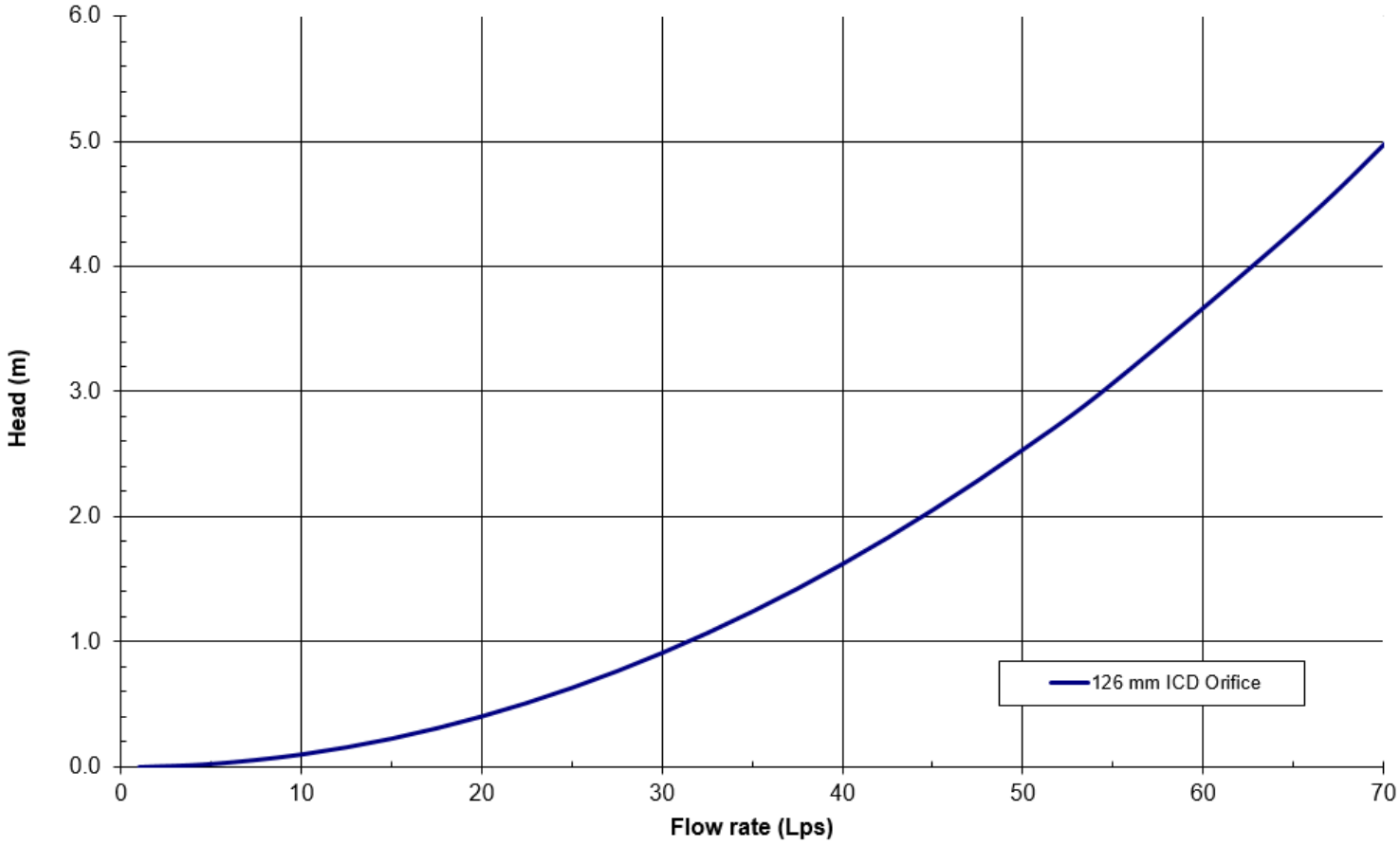
Flow: **9.3 L/s**
Head: **1.61 m**
CB 01



IPEX

Tempest MHF ICD Flow Curve

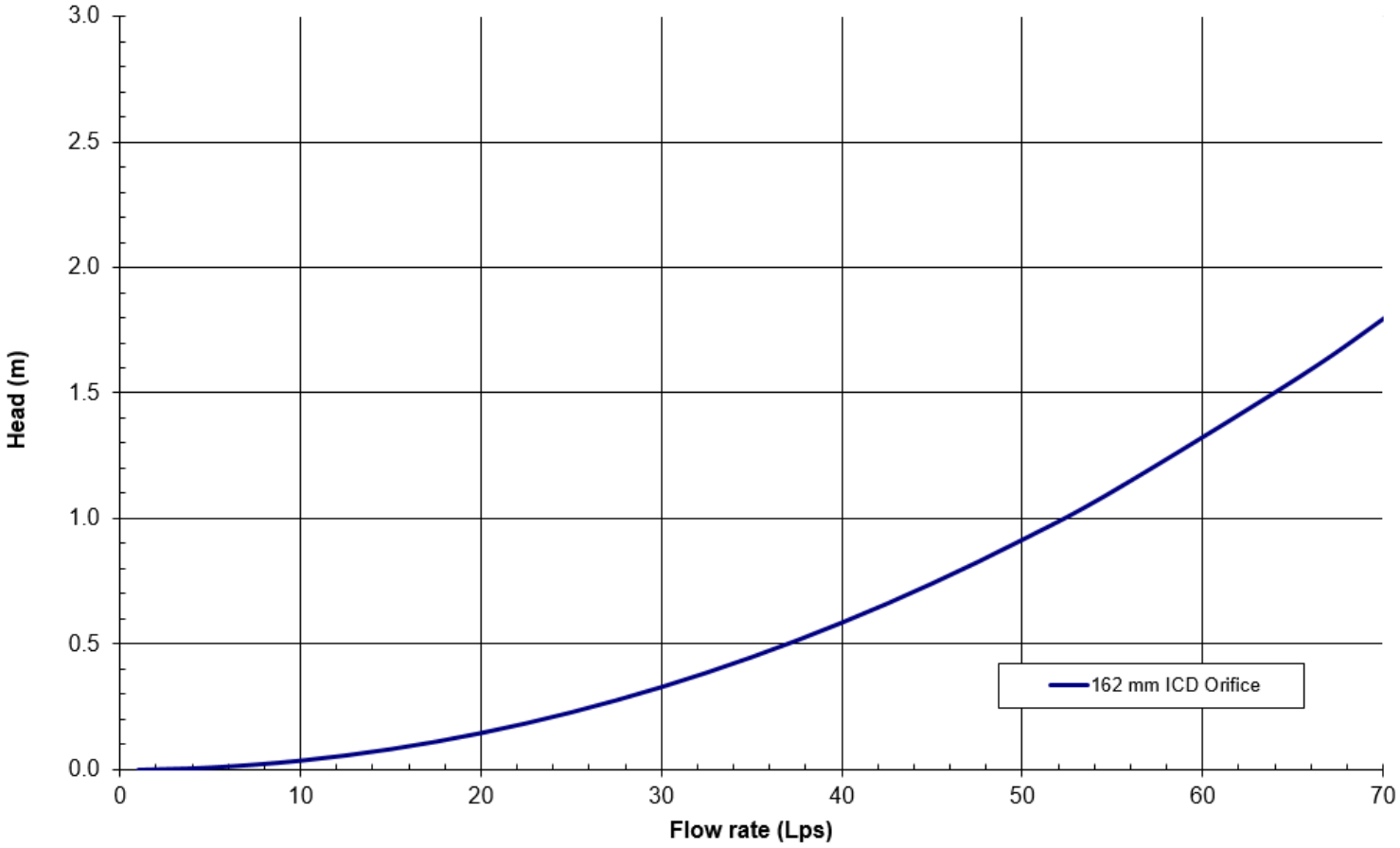
Flow: **39 L/s**
Head: **1.54 m**
CB 02



IPEX

Tempest MHF ICD Flow Curve

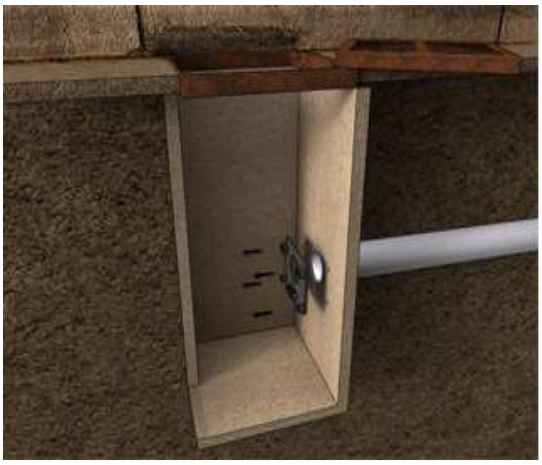
Flow: **59.4 L/s**
Head: **1.29 m**
CB 03

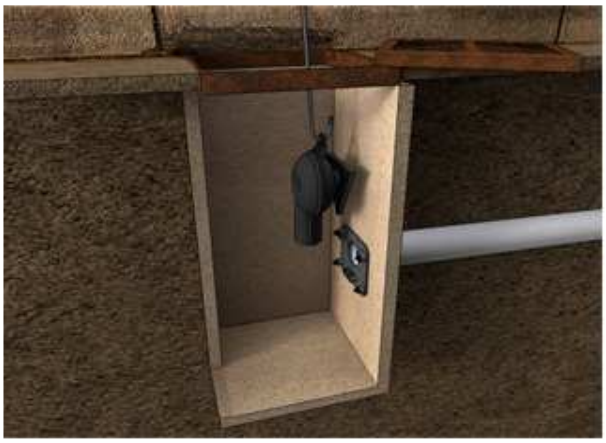


IPEX

Square CB Installation Notes:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8'' concrete bit, torque wrench for 9/16''nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8x3-1/2, (4) washers, (4) nuts
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8'' concrete bit to make the four holes at a minimum of 1-1/2'' depth up to 2-1/2''. Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you will hit the anchors with the hammer. Remove the nuts on the ends of the anchors
5. Install the wall mounting plate on the anchors and screw the nut in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the LMF device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.



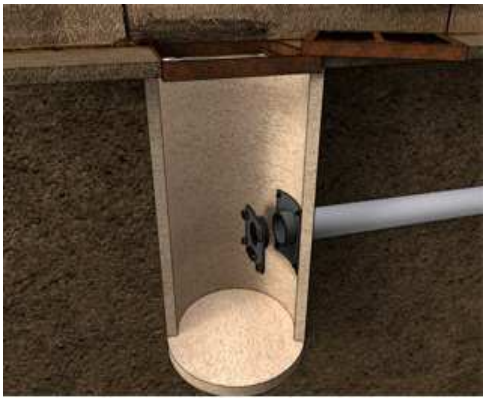


IPEX

Round CB Installation Notes: (Refer to square install notes above for steps 1 , 3, & 4)

2. Use spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lb-ft). There should be no gap between the CB spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate and the spigot of the spigot CB wall plate. Slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered into the mounting plate and has created a seal.






CAUTION/WARNING/DISCLAIM:

- Verify that the inlet(s) pipe(s) is not protruding into the catch basin. If it is, cut it back so that the inlet pipe is flush with the catch basin wall.
- Any required cement in the installation must be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Please refer to the IPEX solvent cement guide to confirm required curing times or attend the IPEX **Online Solvent Cement Training Course**.
- Call your IPEX representative for more information or if you have any questions about our products.

IPEX

IPEX TEMPEST Inlet Control Devices Technical Specification

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's must have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

APPENDIX E

Development Servicing Study Checklist

HERITAGE HILLS RETAIL PLAZA, OTTAWA
DEVELOPMENT SERVICING STUDY CHECKLIST

4.1 General Content	Addressed (Y/N/NA)	Comments
Executive Summary (for larger reports only).	N/A	
Date and revision number of the report.	Y	
Location map and plan showing municipal address, boundary, and layout of proposed development.	Y	
Plan showing the site and location of all existing services.	Y	
Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	N	Refer to Site Plan
Summary of Pre-consultation Meetings with City and other approval agencies.	Y	
Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	N/A	
Statement of objectives and servicing criteria.	Y	
Identification of existing and proposed infrastructure available in the immediate area.	Y	
Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	N/A	
Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighboring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	N/A	

4.1 General Content	Addressed (Y/N/NA)	Comments
Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A	
Proposed phasing of the development, if applicable.	N/A	
Reference to geotechnical studies and recommendations concerning servicing.	Y	
All preliminary and formal site plan submissions should have the following information:		
Metric scale	Y	
North arrow (including construction North)	Y	
Key plan	Y	
Name and contact information of applicant and property owner	Y	
Property limits including bearings and dimensions	Y	
Existing and proposed structures and parking areas	Y	
Easements, road widening and rights-of-way	Y	
Adjacent street names	Y	

4.2 Water	**Addressed (Y/N/NA)**	**Comments**
Confirm consistency with Master Servicing Study, if available.	N/A	
Availability of public infrastructure to service proposed development.	Y	
Identification of system constraints.	N/A	
Identify boundary conditions.	Y	Provided by City of Ottawa
Confirmation of adequate domestic supply and pressure.	Y	
Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Y	
Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	Y	
Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design.	N/A	
Address reliability requirements such as appropriate location of shut-off valves.	Y	
Check on the necessity of a pressure zone boundary modification.	N/A	
Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range.	Y	
Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Y	
Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A	
Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Y	
Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	Y	

4.3 Wastewater	Addressed (Y/N/NA)	**Comments**
Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Y	
Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A	
Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A	
Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Y	
Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Y	
Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Y	
Description of proposed sewer network including sewers, pumping stations, and forcemains.	Y	
Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A	
Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A	
Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A	
Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A	
Special considerations such as contamination, corrosive environment etc.	N/A	

4.4 Stormwater	**Addressed (Y/N/NA)**	**Comments**
Description of drainage outlets and downstream constraints including legality of outlet (i.e. municipal drain, right-of-way, watercourse, or private property).	Y	
Analysis of the available capacity in existing public infrastructure.	N/A	
A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns and proposed drainage patterns.	Y	
Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Y	
Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Y	Water quality control is provided in a downstream SWM facility
Description of stormwater management concept with facility locations and descriptions with references and supporting information.	Y	
Set-back from private sewage disposal systems.	N/A	
Watercourse and hazard lands setbacks.	N/A	
Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	N/A	
Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A	
Storage requirements (complete with calcs) and conveyance capacity for 5 yr and 100 yr events.	Y	
Identification of watercourse within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A	
Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Y	
Any proposed diversion of drainage catchment areas from one outlet to another.	N/A	
Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and SWM facilities.	Y	
If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A	

4.4 Stormwater	**Addressed (Y/N/NA)**	**Comments**
Identification of municipal drains and related approval requirements.	N/A	
Description of how the conveyance and storage capacity will be achieved for the development.	Y	
100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Y	
Inclusion of hydraulic analysis including HGL elevations.	N/A	
Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Y	
Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A	
Identification of fill constrains related to floodplain and geotechnical investigation.	N/A	

4.5 Approval and Permit Requirements	**Addressed (Y/N/NA)**	**Comments**
Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	N/A	
Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	Y	
Changes to Municipal Drains.	N/A	
Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A	

4.6 Conclusion	**Addressed (Y/N/NA)**	**Comments**
Clearly stated conclusions and recommendations.	Y	
Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	Y	T.B.D.
All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario.	Y	

APPENDIX F

Engineering Drawings

LEGEND

- SAN MH 1 — PROPOSED SANITARY MH & SEWER
- CBMH 3 — PROPOSED CATCHBASIN MANHOLE & SEWER
- STM MH 1 — PROPOSED STORM MANHOLE & SEWER
- CB 2 — PROPOSED CATCHBASIN AND LEAD
- HYD — VB — PROPOSED HYDRANT AND VALVE
- PROPOSED BARRIER CURB
- DC — PROPOSED DEPRESSED CURB
- 200mmØ — PROPOSED WATERMAIN AND DIAMETER
- SP — PROPOSED STANDPOST
- BEND — PROPOSED BEND AND THRUSTBLOCK 11.25°, 22.5°, 45° or TEE
- PROPOSED CAP
- ICD — PROPOSED INLET CONTROL DEVICE
- RD — CONTROLLED FLOW ROOF DRAIN
- DD — MECHANICAL DECK DRAIN / UNCONTROLLED ROOF DRAIN
- THERMAL INSULATION FOR SHALLOW SEWERS
- PROPOSED BUILDING ENTRANCE
- C.S. — PROPOSED CLAY SEAL SEEPAGE BARRIER (PER GEOTECHNICAL REPORT)
- PROPOSED STRUCTURAL RETAINING WALL

- SAMH — EXISTING SANITARY MANHOLE AND SEWER
- CBMH — EXISTING CATCHBASIN MANHOLE
- STMMH — EXISTING STORM MANHOLE AND SEWER
- CB — EXISTING CATCHBASIN C/W CATCHBASIN LEAD
- HYD — EXISTING HYDRANT
- EX UP — EXISTING UTILITY POLE C/W GUY WIRES
- 300mmØ WM — EXISTING WATERMAIN
- HYD — EXISTING HYDRANT C/W VALVE & LEAD
- LS — EXISTING LIGHT STANDARD
- EXISTING CONCRETE CURB
- EXISTING FENCE
- OHW — OHW — EXISTING OVERHEAD UTILITY WIRES
- PROPOSED WATER METER AND REMOTE METER
- PROPOSED GAS METER

GENERAL NOTES:

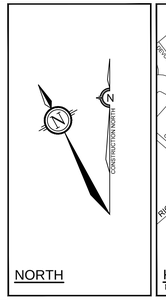
1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $5,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO GEOTECHNICAL REPORT (NO. PG4564-1_REVISION 1, DATED NOVEMBER 7, 2018), PREPARED BY PATERSON GROUP INC., FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
9. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING AND HARDSURFACE AREAS AND DIMENSIONS.
10. REFER TO STORMWATER MANAGEMENT REPORT(R-2018-158) PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
11. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
12. PROVIDE LINE/PARKING PAINTING.
13. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES INDICATING ALL SERVICING AS-BUILT INFORMATION SHOWN ON THIS PLAN. AS-BUILT INFORMATION MUST INCLUDE: PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS, VALVE AND HYDRANT LOCATIONS, T/WM ELEVATIONS AND ANY ALIGNMENT CHANGES, ETC.

SEWER NOTES:

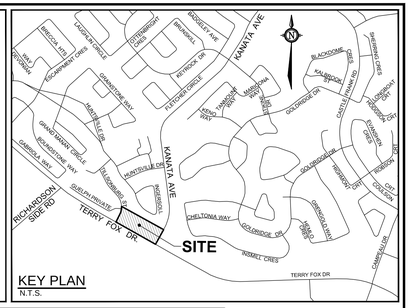
1. SUPPLY AND CONSTRUCT ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
CATCHBASIN (600x600mm)	705.010	OPSD
STORM / SANITARY MANHOLE (1200mmØ)	701.010	OPSD
CB, FRAME & COVER	400.020	OPSD
STORM / SANITARY MH FRAME & COVER	401.010	OPSD
WATERTIGHT MH FRAME AND COVER	401.030	OPSD
SEWER TRENCH	S6	CITY OF OTTAWA
STORM SEWER	PVC DR 35	
SANITARY SEWER	PVC DR 35	
CATCHBASIN LEAD	PVC DR 35	

3. ALL STORM AND SANITARY SERVICE LATERALS SHALL BE EQUIPPED WITH BACKFLOW PREVENTION DEVICES AS PER THE CITY OF OTTAWA STANDARD DETAILS S14 AND S14.1 OR S14.2.
4. INSULATE ALL PIPES (SAN/STM) THAT HAVE LESS THAN 1.5m COVER WITH HI-40 INSULATION PER INSULATION DETAIL FOR SHALLOW SEWERS. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
5. SERVICES ARE TO BE CONSTRUCTED TO 1.0m FROM FACE OF BUILDING AT A MINIMUM SLOPE OF 1.0%.
6. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
7. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTING PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL). THE CONCRETE CRADLE FOR THE PIPE CAN BE ELIMINATED.
8. THE OWNER SHALL REQUIRE THAT THE SITE SERVICING CONTRACTOR PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 410.07.16, 410.07.16.04 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF A CERTIFIED PROFESSIONAL ENGINEER WHO SHALL SUBMIT A CERTIFIED COPY OF THE TEST RESULTS.
9. ALL STORM MANHOLES AND CATCHBASIN MANHOLES ARE TO HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED. ALL CATCHBASINS ARE TO HAVE 600mm SUMPS UNLESS OTHERWISE INDICATED.
7. ALL CATCHBASINS, MANHOLES AND/OR CATCHBASIN MANHOLES THAT ARE TO HAVE ICD'S INSTALLED WITHIN THEM ARE TO HAVE 600mm SUMPS.
8. ALL WEEPING TILE CONNECTIONS TO BE MADE TO THE PROPOSED STORM SEWER SYSTEM DOWNSTREAM OF ANY INLET CONTROL DEVICES.
9. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mmØ OR GREATER PRIOR TO BASE COURSE ASPHALT. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES.



NORTH



KEY PLAN
N.T.S.

INLET CONTROL DEVICE - DATA TABLE

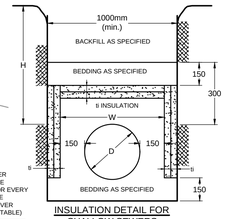
CB I.D.	ICD TYPE	DIAMETER OF OUTLET PIPE (mm)	DESIGN FLOW (L/s)		DESIGN HEAD (m)	
			2-YEAR	100-YEAR	2-YEAR	100-YEAR
CB 1	TEMPEST LMF (Vortex 90)	300	6.7	9.3	0.91	1.61
CB 2	TEMPEST MHF (126mmØ)	300	32.0	39.0	1.06	1.54
CB 3	TEMPEST MHF (162mmØ)	300	30.0	59.4	0.39	1.29

ROOF DRAIN TABLE: AREA R-1 (ROOF DRAINS 1 to 10)

AREA ID *	ROOF DRAIN No. (WATTS MODEL)	ROOF DRAIN OPENING SETTING	1:5 YEAR RELEASE RATE	APPROX. 5 YR PONDING DEPTH	1:100 YEAR RELEASE RATE	APPROX. 100 YR PONDING DEPTH
R-1	RD 1 (RD-100-A-ADJ)	1/2 EXPOSED	0.79 L/s	9 cm	1.10 L/s	13 cm
R-1	RD 2 (RD-100-A-ADJ)	1/2 EXPOSED	0.79 L/s	6 cm	0.95 L/s	10 cm
R-1	RD 3 (RD-100-A-ADJ)	1/2 EXPOSED	0.79 L/s	9 cm	1.10 L/s	13 cm
R-1	RD 4 (RD-100-A-ADJ)	1/2 EXPOSED	0.79 L/s	9 cm	1.10 L/s	13 cm
R-1	RD 5 (RD-100-A-ADJ)	3/4 EXPOSED	1.10 L/s	11 cm	1.58 L/s	15 cm
R-1	RD 6 (RD-100-A-ADJ)	3/4 EXPOSED	1.10 L/s	11 cm	1.58 L/s	15 cm
R-1	RD 7 (RD-100-A-ADJ)	3/4 EXPOSED	1.10 L/s	11 cm	1.58 L/s	15 cm
R-1	RD 8 (RD-100-A-ADJ)	3/4 EXPOSED	1.10 L/s	11 cm	1.58 L/s	15 cm
R-1	RD 9 (RD-100-A-ADJ)	1/2 EXPOSED	0.95 L/s	10 cm	1.26 L/s	14 cm
R-1 (CANOPY)	RD 10 (UN-CONTROLLED)	- - -	0.42 L/s	- - -	0.79 L/s	- - -

* REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' (R-2018-158) PREPARED BY NOVATECH FOR DRAINAGE AREA IDENTIFIERS AND STORMWATER MANAGEMENT DETAILS.

**ALL CONTROLLED FLOW ROOF DRAINS FOR THE PROPOSED BUILDING TO BE WATTS 'ADJUSTABLE ACCUTROL' ROOF DRAINS.



INSULATION DETAIL FOR SHALLOW SEWERS
NOT TO SCALE

s = THICKNESS OF INSULATION (mm)
h = DEPTH OF COVER
W = D + 300 (1000 min.)
W = WIDTH OF INSULATION (mm)
D = O.D OF PIPE (mm)

INSULATION NOTES:
1. THE THICKNESS OF SEWER INSULATION SHALL BE THE EQUIVALENT OF 25mm FOR EVERY 300mm REDUCTION IN THE REQUIRED DEPTH OF COVER LESS THAN 1500mm (SEE TABLE)

COVER (mm)	INSULATION THICKNESS (mm)
1500-1200	75
1200-900	100
900-600	125

PROPOSED 100mmØ - 200mmØ WATERMAIN TABLE

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
1+00	96.80	93.85	200 X 200 X 200 TEE (STA 0+133.4)
1+03.0	96.78	93.83	CROSS BELOW SAN (±0.5m CLEARANCE)
1+26.4	96.42	93.83	200 x 200 x 150 HYDRANT TEE
1+28.0	96.41	93.83	200 x 100 REDUCER
1+45.4	96.23	93.83	100mmØ VALVE AND VALVE BOX
1+46.4	96.18	93.78	45° HORIZONTAL BEND
1+47.8	96.13	93.73	45° HORIZONTAL BEND
1+59.2	96.20	93.80	45° HORIZONTAL BEND
1+60.6	96.90	93.90	45° HORIZONTAL BEND
1+61.2	96.95	93.90	CAP 1.0m FROM BUILDING FACE

PROPOSED 200mmØ WATERMAIN TABLE

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
0+000	97.71±	94.98± *	TEE CONNECTION TO EX. 200mmØ WM
0+000.3	97.73±	94.98	22.5° VERTICAL BEND
0+002.7	97.55±	95.96 **	CROSS ABOVE EX. SAN (±1.5m CLEARANCE)
0+002.8	97.53±	96.00 **	22.5° VERTICAL BEND
0+004.3	97.38±	96.00 **	CROSS ABOVE EX. STM (±0.3m CLEARANCE)
0+005.8	97.35±	96.00 **	22.5° VERTICAL BEND
0+008.5	97.45±	94.90	22.5° VERTICAL BEND
0+009.8	97.29	94.90	CROSS BELOW EX. UTILITIES (±1.8m CLEARANCE)
0+011.6	97.30	94.90	200mmØ VALVE AND VALVE BOX
0+025.7	96.75	94.35	22.5° HORIZONTAL BEND
0+031±0+036	96.50	94.35 **	INSULATE IN PROXIMITY TO CB 1
0+100	96.80	94.45	- - -
0+133.4	96.80	93.85	200 X 200 X 200 TEE (STA 1+00)
0+136.0	96.75	93.90	200 X 150 REDUCER
0+148.4	96.45	94.05	150mmØ VALVE AND VALVE BOX
0+150.4	96.46	94.05	CAP AT PROPERTY LINE

* 200mm x 200mm x 200mm TEE CONNECTION TO EXISTING 200mmØ WATERMAIN. EXACT ELEVATION TO BE FIELD DETERMINED.

** PROVIDE THERMAL INSULATION AS PER CITY OF OTTAWA DETAIL W23 AND DETAIL W22 WHERE COVER IS LESS THAN 2.4m AND/OR ADJACENT TO OPEN STRUCTURES.

WATERMAIN NOTES:

1. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS, SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY CITY OF OTTAWA FORCES.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN TRENCHING	W17	CITY OF OTTAWA
FIRE HYDRANT INSTALLATION	W19	CITY OF OTTAWA
THERMAL INSULATION IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
INSULATION ADJACENT TO OPEN STRUCTURES	W23	CITY OF OTTAWA
VALVE BOX ASSEMBLY	W24	CITY OF OTTAWA
WATERMAIN	PVC DR 18	

3. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
4. PROVIDE MINIMUM 0.5m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS.
5. PROPOSED WATER SERVICES ARE TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, UNLESS OTHERWISE INDICATED.

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOT FOR CONSTRUCTION

OWNER INFORMATION
7873794 CANADA INC.
43 AURIGA DRIVE, 2ND FLOOR,
NEPEAN, ONTARIO, K2E 7Y8
DENNIS LAURIN
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dennis.laurin@laurin.ca

No.	REVISION	DATE	BY
2	ISSUED FOR SITE PLAN APPROVAL	JAN 25/19	MS
1	ISSUED FOR DESIGN COORDINATION	JAN 17/19	MS

SCALE
1:300
1:300
0 3 6 9 12

DESIGN SM / MS
CHECKED MS
DRAWN SM
CHECKED SM / MS
APPROVED MS

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER M. SAVIC 100102651 Jan 25/19 PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA - 471 TERRY FOX DRIVE
HERITAGE HILLS RETAIL PLAZA

DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 118133
REV REV # 2
DRAWING No. 118133-GP

D07-12-18-XXXX
XXXXX

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PLAN24x36.DWG - 914.4mmx609.6mm

LEGEND

96.65 / 96.66	PROPOSED ELEVATION / *EXISTING ELEVATION*
× 96.44	EXISTING ELEVATION
96.10(S)	PROPOSED SWALE ELEVATION
98.70 TW / 97.60 BW	PROPOSED TOP OF WALL ELEVATION / PROPOSED BOTTOM OF WALL ELEVATION
96.95	PROPOSED TERRACE ELEVATION
2.0%	GRADE AND DIRECTION
	MAXIMUM 3:1 SIDESLOPE
	EMERGENCY OVERLAND FLOW ROUTE
SAN MH 1	PROPOSED SANITARY MANHOLE
CBMH 3	PROPOSED CATCHBASIN MANHOLE
STM MH 1	PROPOSED STORM MANHOLE
CB	PROPOSED CATCHBASIN
HYD / VVB	PROPOSED HYDRANT AND VALVE
	PROPOSED BARRIER CURB (PER SC1.1)
DC	PROPOSED DEPRESSED CURB (PER SC1.1)
MC	PROPOSED MOUNTABLE CURB (PER SC1.3)
DMC	DEPRESSED MOUNTABLE CURB (PER SC1.3
ICD	PROPOSED INLET CONTROL DEVICE
RD	PROPOSED ROOF DRAIN
FFE=96.95	PROPOSED FINISHED FLOOR ELEVATION
	PROPOSED STRUCTURAL RETAINING WALL
	PROPOSED BUILDING ENTRANCE
	PROPOSED SILT FENCING (OPSD 219.110)
M M	PROPOSED MUD MAT / CONSTRUCTION ENTRANCE
1:5 YR / 1:100 YR	APPROXIMATE PONDING LIMITS
	EXISTING CONCRETE CURB
SANMH	*EXISTING SANITARY MANHOLE*
CBMH	*EXISTING CATCHBASIN MANHOLE*
STMMH	*EXISTING STORM MANHOLE*
CB	*EXISTING CATCHBASIN*
HYD / VV	*EXISTING HYDRANT & VALVE*
	EXISTING TREES / VEGETATION
EX UP	*EXISTING UTILITY POLE C/W GUY WIRES*
	EXISTING FENCE
	EXISTING LIGHT STANDARD

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $5,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO GEOTECHNICAL REPORT (No. PG4564-1_Revision 1, DATED NOVEMBER 7, 2018), PREPARED BY PATERSON GROUP INC., FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
9. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARD SURFACE AREAS AND DIMENSIONS.
10. REFER TO STORMWATER MANAGEMENT REPORT (R-2018-158) PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
11. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
12. PROVIDE LINE/PARKING PAINTING.

PAVEMENT STRUCTURES:

LIGHT DUTY (NEW PAVEMENT)
50mm HL3 or SUPERPAVE 12.5
150mm GRANULAR "A"
300mm GRANULAR "B" TYPE II
ASPHALT GRADE PG 58-34
*INSTALLED PER GEOTECHNICAL REPORT

HEAVY DUTY (NEW PAVEMENT)
40mm HL3 or SUPERPAVE 12.5
50mm HL8 or SUPERPAVE 19.0
150mm GRANULAR "A"
450mm GRANULAR "B" TYPE II
ASPHALT GRADE PG 58-34
* INSTALLED PER GEOTECHNICAL REPORT

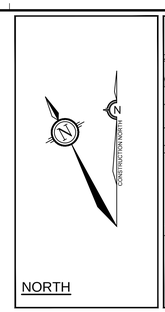
GRADING NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED PAVED AREAS AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF GRANULARS.
3. ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUB-EXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.
4. THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 98% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
5. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
6. MAXIMUM TERRACING GRADE TO BE 3:1 UNLESS OTHERWISE NOTED.
7. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
8. ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1). MOUNTABLE CURBS ARE TO BE PER CITY OF OTTAWA STANDARD (SC1.3).
9. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.
10. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING AS-BUILT ELEVATIONS OF ALL DESIGN GRADES SHOWN ON THIS PLAN.

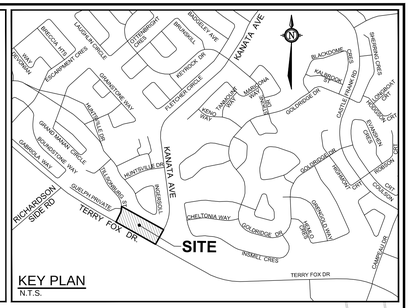
EROSION AND SEDIMENT CONTROL NOTES :

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

1. ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED TO THE SATISFACTION OF THE ENGINEER AND THE CITY OF OTTAWA. THEY ARE TO BE APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION. THESE PRACTICES ARE TO BE IMPLEMENTED IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL AND SHOULD INCLUDE AS A MINIMUM THOSE MEASURES INDICATED ON THE PLAN.
2. EROSION AND SEDIMENT CONTROL MEASURES WILL BE IMPLEMENTED DURING CONSTRUCTION IN ACCORDANCE WITH THE "GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES" (GOVERNMENT OF ONTARIO, MAY 1987). THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEETING ALL REGULATORY AGENCY REQUIREMENTS.
3. TO PREVENT SURFACE EROSION FROM ENTERING ANY STORM SEWER SYSTEM DURING CONSTRUCTION, FILTER CLOTH WILL BE PLACED UNDER GRATES OF NEARBY CATCHBASINS AND STRUCTURES. A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED AROUND THE CONSTRUCTION AREA (WHERE APPLICABLE). THESE CONTROL MEASURES WILL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
4. TO LIMIT EROSION: MINIMIZE THE AMOUNT OF EXPOSED SOILS AT ANY GIVEN TIME, RE-VEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE AND PROTECT EXPOSED SLOPES WITH NATURAL OR SYNTHETIC MULCHES.
5. FOR MATERIAL STOCKPILING: MINIMIZE THE AMOUNT OF EXPOSED MATERIALS AT ANY GIVEN TIME; APPLY TEMPORARY SEEDING, TARPS, COMPACTION AND/OR SURFACE ROUGHENING AS REQUIRED TO STABILIZE STOCKPILED MATERIALS THAT WILL NOT BE USED WITHIN 14 DAYS.
6. THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE ENGINEER, THE MEASURES ARE NO LONGER REQUIRED. NO CONTROL MEASURES MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE ENGINEER.
7. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO ANY STORM SEWER SYSTEM. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
8. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
9. ROADWAYS ARE TO BE SWEPT AS REQUIRED OR AS DIRECTED BY THE ENGINEER AND/OR THE MUNICIPALITY.
10. THE CONTRACTOR SHALL ENSURE PROPER DUST CONTROL IS PROVIDED WITH THE APPLICATION OF WATER (AND IF REQUIRED, CALCIUM CHLORIDE) DURING DRY PERIODS. MONITOR DUST LEVELS DURING SITE PREPARATION/EXCAVATION, AND CONSTRUCTION ACTIVITIES, AND WHEN DUST LEVELS BECOME VISUALLY APPARENT SPRAY WATER TO MINIMIZE THE RELEASE OF DUST FROM GRAVEL, PAVED AREAS AND EXPOSED SOILS. USE CHEMICAL DUST SUPPRESSANTS ONLY WHERE NECESSARY ON PROBLEM AREAS.



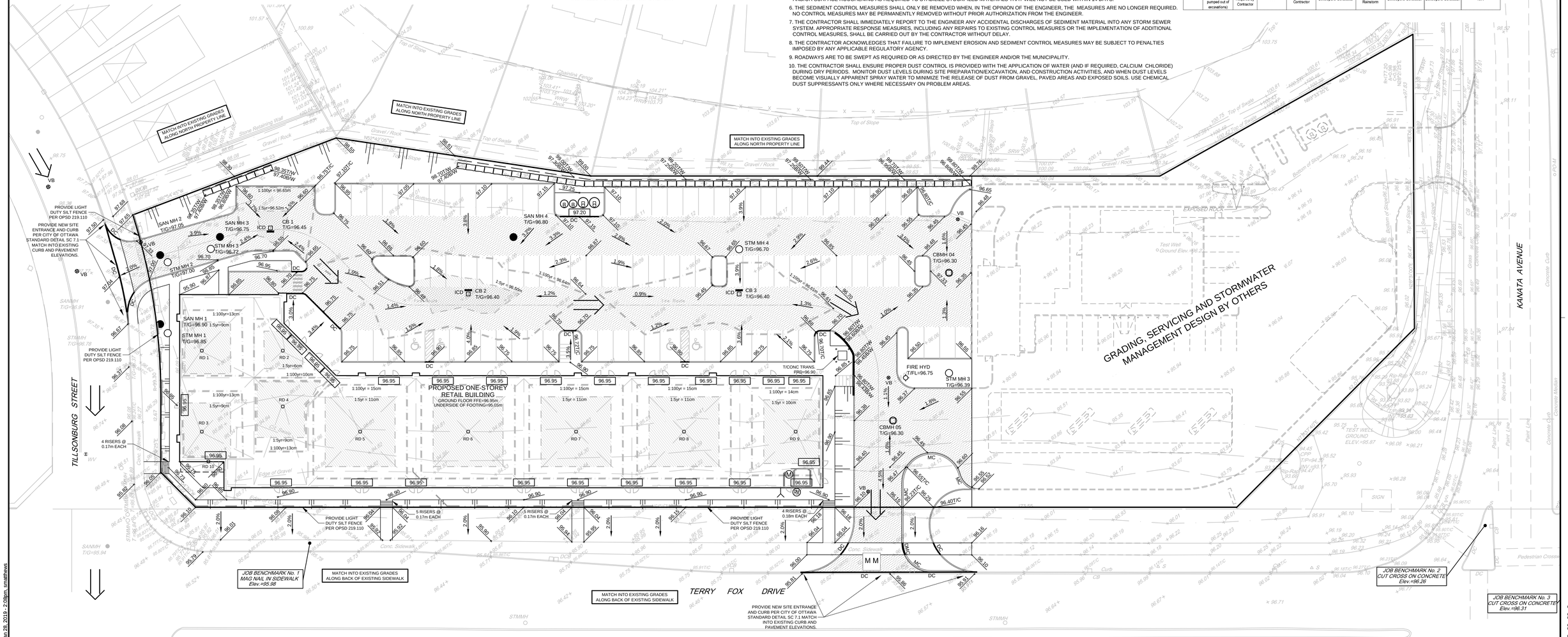
NORTH



KEY PLAN
N.T.S.

Erosion and Sediment Control Responsibilities:

	ESC Measure	Symbol	Specification	During Construction: Installation Responsibility	During Construction: Inspection/Maintenance Responsibility	During Construction: Inspection Frequency	After Construction Prior to Final Acceptance: Approval to Remove	After Final Acceptance: Removal Responsibility	After Final Acceptance: Inspection/Maintenance Responsibility
Temporary Measures	Silt Fence	----	OPSD 219.110	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Filter Fabric		Location as Indicated in ESC Note #3	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Mud Mat	M M	Drawing Details	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Dust Control		Location as Required Around Site	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Stabilized Material Stockpiling		Location as Required by Contractor	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Sediment Basin (for flows being pumped out of excavations)		Location as Required by Contractor	Developer's Contractor	Developer's Contractor	After Every Rainstorm	Developer's Contractor	Developer's Contractor	N/A



NOTE:
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OWNER INFORMATION
7873794 CANADA INC.
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NEPEAN, ONTARIO, K2E 7Y8
DENNIS LAURIN
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No.	REVISION	DATE	BY
2	ISSUED FOR SITE PLAN APPROVAL	JAN 25/19	MS
1	ISSUED FOR DESIGN COORDINATION	JAN 17/19	MS

SCALE: 1:300
1:300
0 3 6 9 12

DESIGN: SM / MS
CHECKED: MS
DRAWN: SM
CHECKED: SM / MS
APPROVED: MS

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
M. SAVIC
100102651
PROVINCE OF ONTARIO

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Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA - 471 TERRY FOX DRIVE
HERITAGE HILLS RETAIL PLAZA

DRAWING NAME
GRADING AND EROSION & SEDIMENT CONTROL PLAN

PROJECT No. 118133
REV REV # 2
DRAWING No. 118133-GR

D07-12-18-XXXX
XXXXX

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LEGEND

- PROPOSED BARRIER CURB
- DC — PROPOSED DEPRESSED CURB
- DRAINAGE AREA LIMITS
- 1:5 YR / 1:100 YR — APPROXIMATE PONDING LIMITS
- A-2 / 0.170 / 0.82 — POST-DEVELOPMENT AREA ID; POST-DEVELOPMENT DRAINAGE AREA (ha); 1:5 YEAR WEIGHTED RUNOFF COEFICIENT
- STM MH — PROPOSED STORM MANHOLE
- CBMH — PROPOSED CATCHBASIN MANHOLE
- CB — PROPOSED CATCHBASIN
- PROPOSED STRUCTURAL RETAINING WALL
- RD — CONTROLLED FLOW ROOF DRAIN
- OD — UNCONTROLLED OVERFLOW ROOF DRAIN
- PROPOSED STORM SEWER AND FLOW DIRECTION
- ICD — PROPOSED INLET CONTROL DEVICE
- EMERGENCY OVERLAND FLOW ROUTE
- PROPOSED BUILDING ENTRANCE / EXIT
- STM MH — EXISTING STORM MH & SEWER
- CB — EXISTING CATCHBASIN C/W CATCHBASIN LEAD
- MAXIMUM 3:1 SIDESLOPE

ROOF DRAIN TABLE: AREA R-1 (ROOF DRAINS 1 to 10)

AREA ID *	ROOF DRAIN No. (WATTS MODEL)	ROOF DRAIN OPENING SETTING	1:5 YEAR RELEASE RATE	APPROX. 5 YR PONDING DEPTH	1:100 YEAR RELEASE RATE	APPROX. 100 YR PONDING DEPTH
R-1	RD 1 (RD-100-A-ADJ)	1/2 EXPOSED	0.79 L/s	9 cm	1.10 L/s	13 cm
R-1	RD 2 (RD-100-A-ADJ)	1/2 EXPOSED	0.79 L/s	6 cm	0.95 L/s	10 cm
R-1	RD 3 (RD-100-A-ADJ)	1/2 EXPOSED	0.79 L/s	9 cm	1.10 L/s	13 cm
R-1	RD 4 (RD-100-A-ADJ)	1/2 EXPOSED	0.79 L/s	9 cm	1.10 L/s	13 cm
R-1	RD 5 (RD-100-A-ADJ)	3/4 EXPOSED	1.10 L/s	11 cm	1.58 L/s	15 cm
R-1	RD 6 (RD-100-A-ADJ)	3/4 EXPOSED	1.10 L/s	11 cm	1.58 L/s	15 cm
R-1	RD 7 (RD-100-A-ADJ)	3/4 EXPOSED	1.10 L/s	11 cm	1.58 L/s	15 cm
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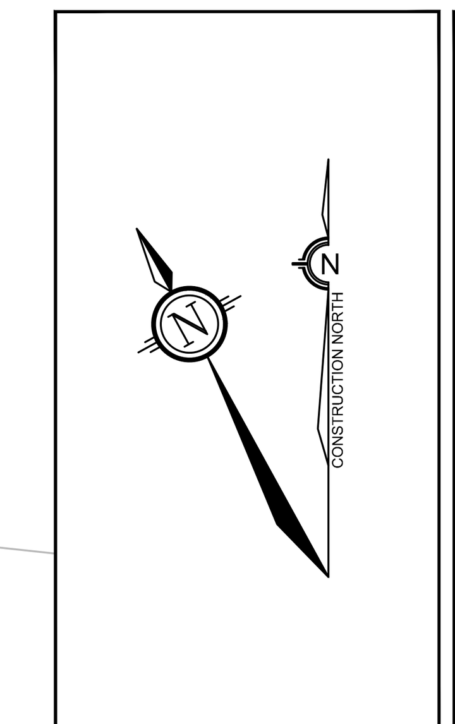
R-1	RD 9 (RD-100-A-ADJ)	1/2 EXPOSED	0.95 L/s	10 cm	1.26 L/s	14 cm
R-1 (CANOPY)	RD 10 (UN-CONTROLLED)	- - -	0.42 L/s	- - -	0.79 L/s	- - -

* REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' (R-2018-158) PREPARED BY NOVATECH FOR DRAINAGE AREA IDENTIFIERS AND STORMWATER MANAGEMENT DETAILS.

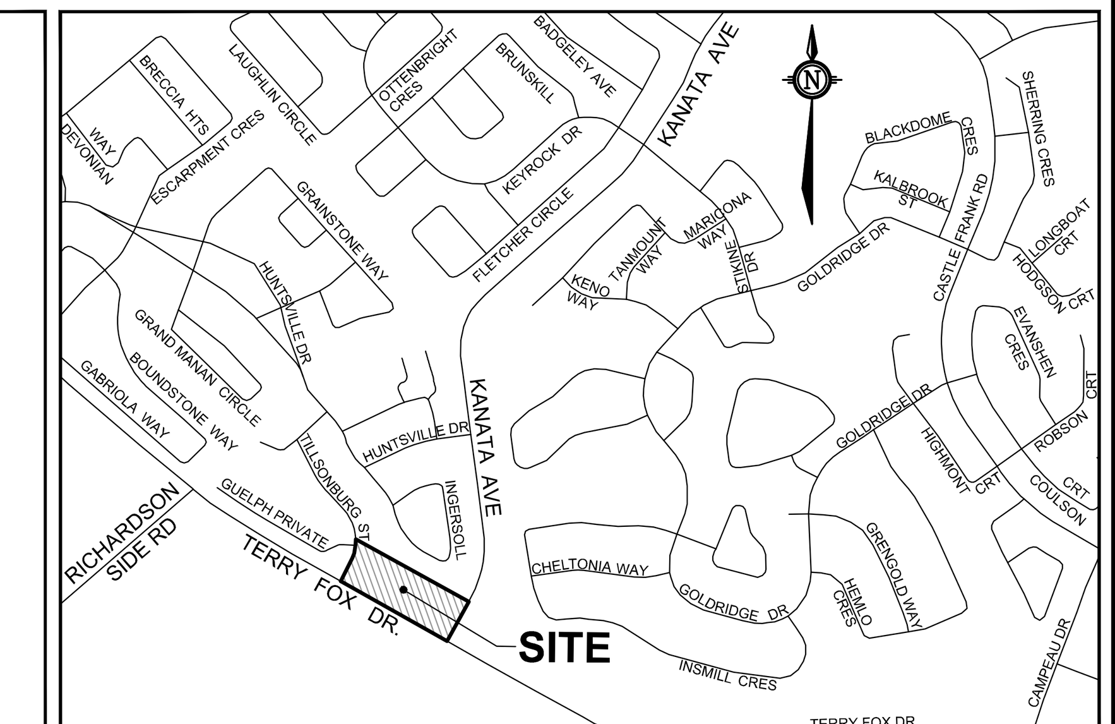
**ALL CONTROLLED FLOW ROOF DRAINS FOR THE PROPOSED BUILDING TO BE WATTS 'ADJUSTABLE ACCUTROL' ROOF DRAINS.

INLET CONTROL DEVICE - DATA TABLE

CB I.D.	ICD TYPE	DIAMETER OF OUTLET PIPE (mm)	DESIGN FLOW (L/s)		DESIGN HEAD (m)	
			2-YEAR	100-YEAR	2-YEAR	100-YEAR
CB 1	TEMPEST LMF (Vortex 90)	300	6.7	9.3	0.91	1.61
CB 2	TEMPEST MHF (126mmØ)	300	32.0	39.0	1.06	1.54
CB 3	TEMPEST MHF (162mmØ)	300	30.0	59.4	0.39	1.29



NORTH



KEY PLAN
N.T.S.

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOT FOR CONSTRUCTION

OWNER INFORMATION
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No.	REVISION	DATE	BY
2	ISSUED FOR SITE PLAN APPROVAL	JAN 25/19	MS
1	ISSUED FOR DESIGN COORDINATION	JAN 17/19	MS

SCALE 1:300

DESIGN SM / MS
CHECKED MS
DRAWN SM
CHECKED SM / MS
APPROVED MS

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER M. SAVIC 100102651 JAN 25/19 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER C. M. STANG 100125708 Jan. 25/19 PROVINCE OF ONTARIO

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LOCATION
CITY OF OTTAWA - 471 TERRY FOX DRIVE
HERITAGE HILLS RETAIL PLAZA

DRAWING NAME
STORMWATER MANAGEMENT PLAN

PROJECT No. 118133
REV REV # 2
DRAWING No. 118133-SWM

D07-12-18-XXXX
XXXXX