Functional Servicing and Stormwater Management Report

Brock Zents Townhomes

November 2022 - Project No. 18138
The Brock-Zents Partnership

TYLin

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1. Introduction

TYLin has been retained by The Brock-Zents Partnership to prepare a detailed Functional Servicing and Stormwater Management Report along with a corresponding grading and servicing design in support of the Official Plan Amendment and Zoning By-law Amendment. The subject property is located at the southwest corner of Brock Road and Zents Drive at municipal addresses 2660, 2670, and 2680 Brock Road North in the City of Pickering (refer to **Figure 1.1**).

This report will:

- Provide background information regarding the subject property;
- Summarize the existing site conditions;
- Provide information regarding the proposed development conditions;
- Outline the proposed grading for the development; and
- Outline the existing and proposed municipal servicing.

The recommended servicing has been developed in accordance with the applicable design criteria and requirements of the City of Pickering (the City), the Region of Durham (the Region) and the Toronto Region Conservation Authority (TRCA).

Figure 1-1 Location Plan

1.1. PROJECT BACKGROUND

The total property is approximately 2.63ha in area and sees the amalgamation of three existing properties at municipal addresses 2660, 2670, and 2680 Brock Road in the City of Pickering. The site is currently occupied by single unit dwellings on each property that backs into a woodlot.

The subject site is bound by Zents Drive to the north, Brock Road North to the east, a woodlot to the west, and vacant land to the south. Four Seasons Lane is a future north-south collector road that is currently being planned along the west side of the property and will span between Zents Drive and Dersan Street (by TYLin and GHD).

The existing topography of the site slopes from west to east and north to south, towards the ditch located along the west side of the Brock Road sidewalk, and with elevation differences of up to 4.0m across the length of the site.

1.2. PROPOSED DEVELOPMENT

The proposed development of the site includes the construction of 17 townhouse blocks with a total of 195 3-storey townhouses. Each townhouse is provided 2 resident parking spaces, totaling 390 parking units, and 44 visitor parking units are also proposed. Private roads are proposed within the site interior to provide vehicular access to the townhouse units.

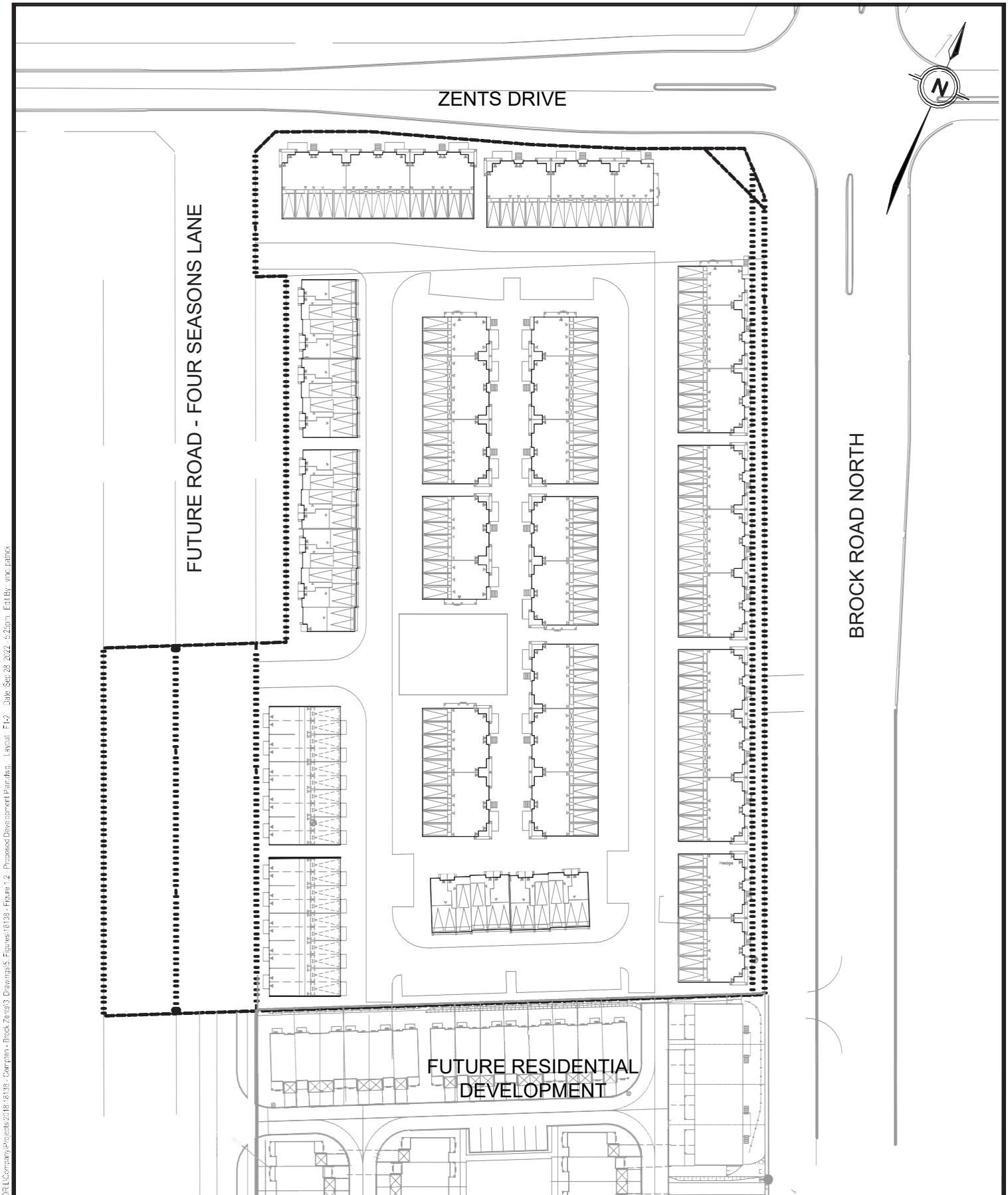
Refer to **Figure 1-1** for the proposed development plan.

1.3. SITE ACCESS

The site's main vehicular access will be made off the future north-south collector road that spans between Brock Road and Dersan Street. A right-in/right-out entrance is also proposed off this road and is located towards the north, near Zents Drive.

1.4. UTILITIES

As the proposed development is currently occupied by residential dwellings, all utilities including telephone, cable, electricity, and gas are readily available to service the subject property from Zents Drive and Brock Road North. The future north-south collector road may also extend new utilities which may service the subject property as well.



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BROCK ZENTS TOWNHOMES
2660-2680 BROCK ROAD NORTH
PROPOSED DEVELOPMENT PLAN

SCALE:	N.T.S.
DATE:	AUGUST 2022
DESIGNED BY:	V.P.
CHECKED BY:	L.P.

PROJECT No.
18138

FIGURE No.
1-2

File: I:\TYLCOM\Files\OT\Tyln TOR\Company\Projects\2018\18138 - Compton - Brock Zents\3 Drawings\5 Figures\18138 - Figure 1-2 - Proposed Development Plan.dwg Layout: F1x2 Date: Sep 28, 2022 - 5:25pm Edit By: vinc.patrick

2. Stormwater Management

2.1. Existing Stormwater Management

The existing topography of the site slopes from west to east, and north to south, with low points at the ditch located along Brock Road along the east property limit.

The following documents were obtained from the City and relate to the stormwater management requirements and existing conditions for the subject site:

- Duffin Heights Environmental Servicing Plan (ESP), Appendix H Master Drainage Study by Sernas Associates, dated April 2010, herein referred to as "ESP";
- Duffin Heights Stormwater Management Facility Design Brief (SWMF#4) by Sernas Associates, dated August 2012, herein referred to as "SWMF#4 brief";
- Brock Road Clean Water Collector Sewer, Drawing 101 by Stantec, dated November 2021

The existing site servicing details obtained from the City of Pickering indicate the following storm sewer infrastructure within the vicinity of the site:

- A 300mm PVC clean water collector (CWC) pipe at 0.50% slope, flowing southerly and located along the Brock Road property line frontages;
- A 900mm concrete storm sewer pipe at 0.50% slope, flowing southerly and located along the west gutter of Brock Road;
- Three 300mm PVC CWC plugged service connections at 0.50% slope are made to the subject property at each existing municipal address (2660, 2670, 2680 Brock Road).

As per Section 3.2.2.2 of the ESP, the 2-year minor storm drainage from the subject site will be collected and conveyed via a clean water collector pipe (CWC) and released into West Tributary Branch 1 (WTB1). Major system flows (up to and including the 100-year storm event) will be conveyed overland to Brock Road and south along the right-of-way to discharge into SWMF#4. Based on Figure 6.3 of the ESP, the site is prescribed a unit discharge rate of **6.91L/s/ha** based on a 2-year return period. With a total site area of 2.63ha, the allowable release rate into the CWC and WTB1 is calculated as **18.2L/s**.

As per Section 3.0 of the SWMF#4 brief, the site will be required to control the 2-year post-development storm to this flow rate to be received by the 300mm CWC on Brock Road. All flows above the 2-year storm event and up to the 10-year storm event will be conveyed overland and captured by a catchbasin on the development to be received by the proposed storm sewer on Brock Road. Flows above the 10-year storm up to the 100-year storm event will drain overland to Brock Road where they will be captured and conveyed to SWMF#4. Refer to **Figure 2-1** for the Existing Drainage Area Plan.

2.2. PROPOSED STORMWATER MANAGEMENT

The proposed stormwater management design is based on the MOE 2003 Stormwater Management Planning & Design (SWMPD), the City of Pickering Stormwater Management Design Guidelines (July 2019), the Toronto Region Conservation Authority "Stormwater Management Criteria" (August 2012). Further criterion has been established in the Duffin Heights Environmental Servicing Plan (ESP) and Design Brief for the SWMF#4, of which the subject site has allocation to. Key excerpts from these reports can be found in **Appendix D**.

2.2.1. Stormwater Management Design Criteria

Based on the review of these documents the site will be required to adhere to the following criteria:

Stormwater Quantity Control

- Control the 2-year post-development storm flows to 6.91L/s/ha to the clean water collector pipe on Brock Road.
- All storm events above the 2-year storm will spill to Brock Road and ultimately conveyed to SWM Facility #4 (Section 4.2.1.3 of Appendix H of the ESP).

Stormwater Quality Control

- As per the DH ESP, stormwater shall be treated to 80% TSS removal into the receiving clean water collector pipe.

Stormwater Water Balance

- Post-development infiltration shall be adopted for the site through a best-efforts approach to reduce direct runoff and promote groundwater recharge.
- As per the DH ESP, site runoff at a unit flow rate of 6.91L/s/ha must be met to maintain base flows into West Tributary Branch 1 of Urfe Creek.

2.2.2. Proposed Stormwater Outlet Connection

The proposed storm connection will be made to the existing 300mm storm sewer on the west side of the Brock Road North right-of-way. The 300mm storm sewer has allocation to receive the 2-year storm flows at a rate of 6.91L/s/ha from the subject property based on Duffin Heights ESP. In order to discharge to this storm sewer, the proposed development will be required to control the post development 2-year storm to a flow rate of 18.2L/s (2.63ha total site area multiplied by 6.91L/s/ha).

The proposed sewer infrastructure is shown on the **Servicing Plan (S1).**

2.2.3. Stormwater Quantity Control

The proposed quantity controls are based on the drainage allocation of the subject site as defined in the Duffin Heights Environmental Servicing Plan (ESP) with key excerpts found in **Appendix D**. This drainage area plan identifies the receiving 300mm clean water storm pipe on Brock Road North to receive 6.91L/s/ha from the 2680 Brock Road property. In order to connect directly into the Brock Road North storm sewer network, the proposed development will be required to match the post development 2-year flow rates to 18.2L/s, as indicated in Section 2.1.

In post-development conditions, the site has been designed to allow some area along the north, east and west property to flow unrestricted offsite to Zents Drive, Brock Road North and Four Seasons Lane,

respectively. Refer to **Figure 2-1** for Post-Development Drainage Area Plan. The total area of uncontrolled flow to Four Seasons Lane is 788m^2 and will not contribute to the Brock Road North storm system and therefore will be subtracted from the allowable flow rate resulting in a new flow allocation of **17.6L/s** (2.63ha - 0.08ha multiplied by 6.91L/s/ha). The downstream capacity of the receiving storm sewer on Four Seasons Lane will be reviewed at a later stage with the neighboring design.

The remaining uncontrolled flows to Brock Road North and Zents Drive have a total area of 1,142m^2. The unrestricted portion of the site will release 6.2L/s into the Brock Road North storm sewer system based on the 2-year storm event. The stormwater discharge from the remainder of the site will be controlled release from the onsite stormwater management system. Therefore, the total allowable 2-year post development release rate is **11.SL/s** (17.6L/s total minus the 6.2L/s uncontrolled). The detailed calculations of the discharge rates can be found in **Appendix A**.

Based on the orifice sizing calculations, an orifice tube would not be able to achieve the 11.5L/s allowable release rate with the minimum pipe size of 100mm. Similarly, a minimum orifice plate size of 75mm would require a high-water head depth of 0.90m which would result in a very large underground stormwater chamber that would not be feasible as it would restrict the available space for other utilities. Using the Modified Rational Method, the total site storage requirement to control the post-development 2-year storm event to the allowable release rate of 11.5L/s would require 494m^3 of site storage. Thus, the tank footprint required would be 575m^2 (494m^3 / 0.90m at an approximate void ratio of 0.96) and would not be feasible on this site. Therefore, both orifice tube and plate controls would not be feasible for this site.

In order to optimally meet both allowable release rate and quantity storage targets for the site, a flow regulator will be proposed. The Hydro-Brake Flow Control device has been specified to achieve a flow rate of 11.5L/s at 2.64m of head. The required tank footprint is thus 195m^2 (494m^3/ 2.64m at 0.96 void ratio) which will be provided in the chamber provided in the southeast corner of the site. Due to the high groundwater conditions and absence of infiltration targets for this site, it is proposed for this chamber to be water-tight and installed with impermeable liner. Chamber specifications will be provided at a later stage during detailed design.

For all storm events greater than the 2-year storm, flows from the site will be conveyed overland to the Brock Road North right-of-way and be collected within the catch basins within Brock Street South and ultimately conveyed to SWM Facility #4 as detailed in the DH ESP.

Refer to **Figure 2-2** for the proposed drainage area plan, **Appendix A** for the stormwater management calculations, and the Servicing Plan for the location of the proposed storm sewer infrastructure.

2.2.4. Stormwater Quality Control

As per MOE requirements, stormwater quality is required to achieve an average of 80% long-term removal of total suspended solids based on an annual loading basis from all runoff leaving the site.

Much of the site is rooftop or pedestrian hardscape and landscape. Runoff from rooftop areas is considered "clean" water and does not require quality control. The remaining portion of the proposed development area will have paving or other surface types having the potential to generate contaminated runoff. An analysis was completed to determine the TSS removal rate, the site would achieve a 59% removal rate without any additional controls. The remaining TSS removal will be achieved with the installation of Oil-Grit Separator unit system installed immediately downstream of the stormwater management system and prior to release into the clean water collector pipe. With the addition of the OGS system, the total TSS removal rate is **80%.**

Refer to **Appendix A** for the stormwater management calculations and the Servicing Plan (**Drawing S1)** for the location of the proposed storm sewer infrastructure.

2.2.5. Water Balance

The Water Balance Study (Appendix G of the Duffin Heights Environmental Servicing Plan) by Sernas Associates has identified two criteria as it relates to site water balance:

1. Runoff from the site shall maintain a unit flow rate of 6.91L/s/ha into the clean water collector pipe, to maintain base flows to the West Tributary Branch 1 (WTB1) of Urfe Creek.
2. A best efforts approach shall be conducted as it relates to post-development infiltration to promote groundwater recharge due to the increase of direct runoff and reduction of infiltration in the Urfe Creek watershed as a result of urbanization.

As discussed in Section 2.2.3 of this FSR, stormwater quantity controls will be designed to control the minor 2-year storm to 6.91L/s/ha into the clean water collector pipe on Brock Road. All storm events above the 2-year storm will be allowed to flow into the storm sewer on Brock Road through overland flow. This proposed design will ensure that base flows are maintained into the clean water collector pipe and ultimately to WTB1.

As per the hydrogeological report by Terrapex, dated May 26, 2022, groundwater elevations observed through the monitoring wells advanced within the subject site range from 123.62masl to 131.33masl, with an average groundwater elevation of 129.24masl, which is well above the proposed storm sewer inverts and stone base of the proposed underground tank. For adequate underground infiltration to occur, a 1.0m vertical buffer is required above the high groundwater elevation. Therefore, underground infiltration is not feasible for this site.

Opportunities for surface level infiltration using Low Impact Development (LID) systems will be explored at the detailed design stage to achieve best efforts in promoting site infiltration. These can be in the forms of, but not limited to:

1. **Permeable Pavement** in driveways, visitor parking spaces, amenity spaces, and portions of the private laneways;
2. **Rain Gardens** in common element spaces, to receive surface runoff and roof drainage;
3. **Bioswales** between townhouse blocks;
4. **Stormwater Planters and/or Stormwater Tree Trenches** in common element spaces, traffic/parking medians and islands;

The details, suitability, and benefits of these LID techniques will be provided at a later stage during the detailed design of the subject site.

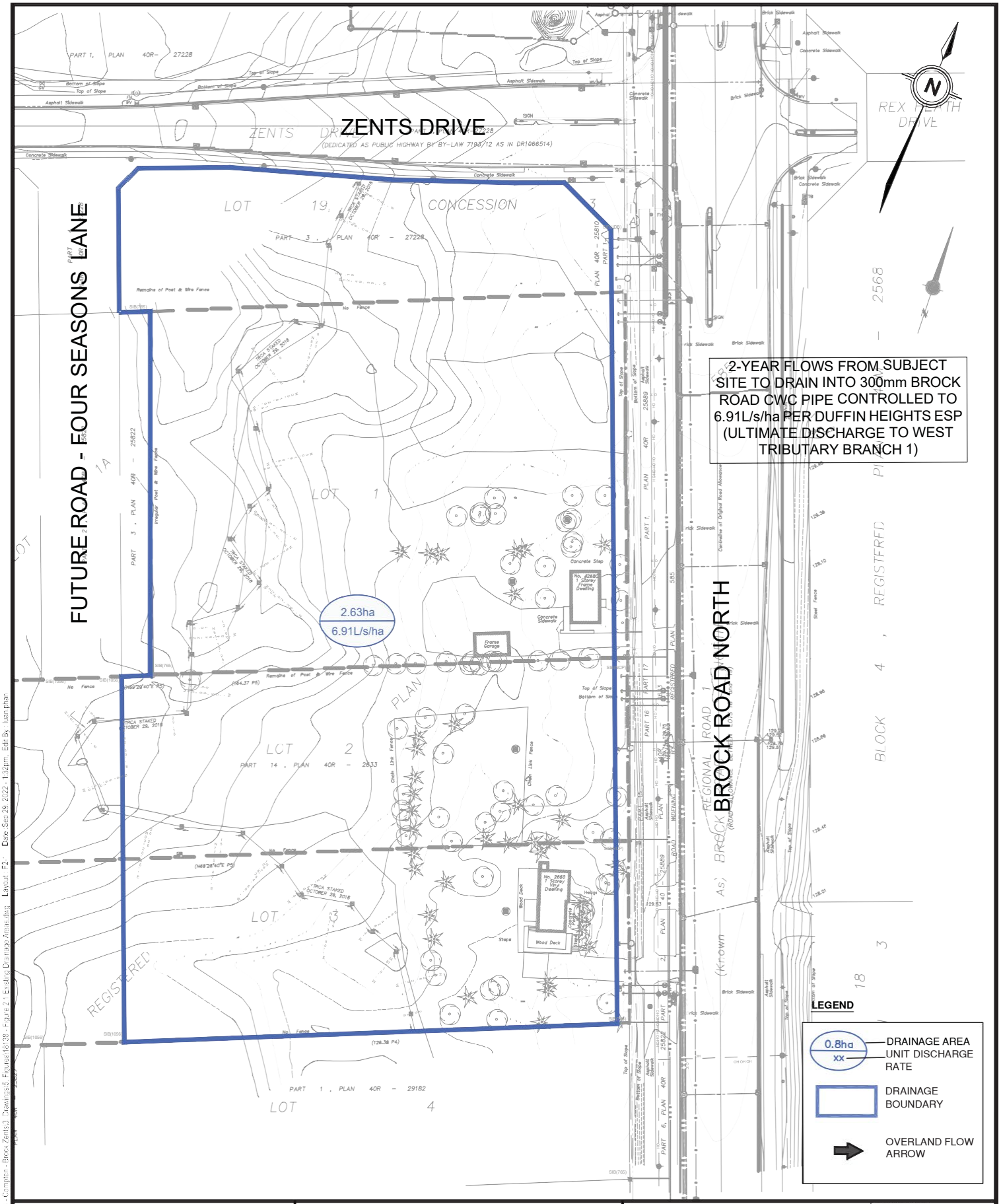
Excerpts from the Water Balance Study of the DH ESP can be found in **Appendix D**.

2.2.6. Construction Erosion and Sediment Control

Details for erosion and sedimentation control during construction will be subject to the City of Pickering approval prior to issuance of Building Permit. During the site grading and servicing works, there is potential for sediment-laden runoff to be directed toward the adjoining properties, municipal streets, and existing storm infrastructure. Therefore, prior to any grading activity, sediment control fencing must be installed along the site perimeter. Additional measures will include construction of an entrance "mud-mat' on the access to be used during construction to minimize mud tracking offsite. Material stockpiles are to be located in appropriate locations. Inlet sediment control devices are to be used on existing catchbasins in municipal right-of-ways that may be affected by the construction of this site and on any inlets that are constructed throughout the duration of construction. The sequencing of the implementation of the above and additional erosion and sediment control measures is summarized in the following table.

Table 2-1: Erosion Control Sequencing

Activity	**Erosion Control Practice**
Area Grading	• Construct and maintain entrance "mud-mat". • Construct and maintain sediment control fencing around the downstream perimeter of the site. • Protect existing catchbasin inlets with Terrafix Silt Sacks • Locate stockpiles away from sensitive areas. • Install cut-off swales, and sediment traps with a perforated vertical riser.
Servicing, Asphalt Works, Building Construction	• Limit open trench lengths to minimize erosion potential of excavated material. • Prevent erosion of material stockpiles. • During work stoppages or inclement weather, plug ends of open sewers to prevent downstream sedimentation. • Protect newly constructed catchbasin inlets with Terrafix Silt Sacks.
Maintenance	• Remove accumulated sediments when depth exceeds 0.30 m. • Maintain and repair sediment control fencing as required. • Maintain and repair catchbasin sediment controls as required.



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BROCK ZENTS TOWNHOMES
2660-2680 BROCK ROAD NORTH
EXISTING DRAINAGE AREA PLAN

SCALE:	N.T.S.
DATE:	AUGUST 2022
DESIGNED BY:	V.P.
CHECKED BY:	L.P.

PROJECT No. 18138

FIGURE No. 2-1

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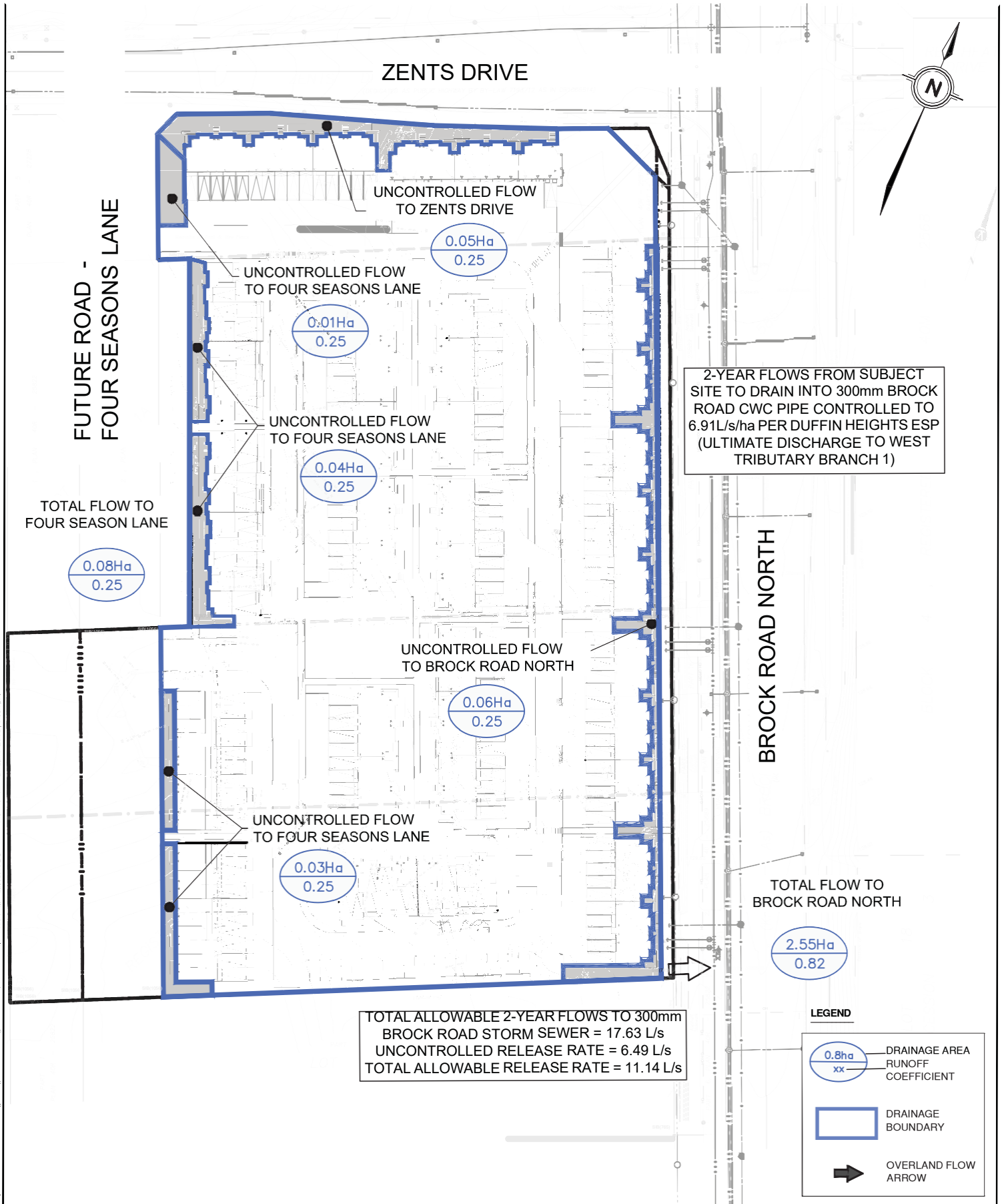

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BROCK ZENTS TOWNHOMES
2660-2680 BROCK ROAD NORTH
PROPOSED DRAINAGE AREA PLAN

SCALE:	N.T.S.
DATE:	AUGUST 2022
DESIGNED BY:	V.P.
CHECKED BY:	L.P.

PROJECT No. 18138

FIGURE No. 2-2

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3. Sanitary Servicing

3.1. Existing Sanitary Servicing

The existing site servicing details obtained from The Region of Durham engineering plan and profiles and a topographical survey completed of the area indicate that there is sanitary sewer infrastructure in the vicinity of the site. The following sanitary infrastructure is adjacent to the subject site:

- A 250mm sanitary stub provided to the subject site located along the northeast property line that connects into;
- A 250mm sanitary sewer located within the Brock Road North right-of-way that flows south.

The site is currently vacant and was previously occupied by two single family residential buildings. Based on the Region of Durham design flow rate of 364L/d/person and a population density of 3.5 persons/unit, the total peak sanitary flow for the two single dwellings (including infiltration allowance) has been calculated as 0.78L/s.

Refer to the **Servicing Drawing (S1)** for the existing sanitary sewer infrastructure and proposed sanitary service design.

3.2. Future Sanitary Servicing

Four Seasons Lane is a future north-south collector road that is currently being planned along the west side of the property and will span between Zents Drive and Dersan Street. The construction of Four Seasons Lane is set to be completed prior to the construction of the subject site.

The servicing plans prepared by TYLin and GHD indicate there will be the following sanitary infrastructure adjacent to the subject site in the future;

- A 300mm sanitary stub provided to the subject site located within the private laneway at the northwest corner of the site that connects into;
- A 300mm sanitary sewer located within the Four Seasons Lane right-of-way that flows south to FUT MH108A (By TYLin) that then connects into;
- A 300mm sanitary sewer located within the Four Seasons Lane right-of-way that flows south to Dersan Street (by GHD)

Refer to the **Servicing Drawing (S1)** for the future sanitary sewer infrastructure and proposed sanitary service design.

3.3. Proposed Sanitary Servicing

A comparative analysis was undertaken to determine peak flows under the existing conditions in comparison with projected peak flows based on the proposed re-development of the site. Design flows for the proposed development has been calculated using the Region of Peel Durham Design Specification for Sanitary Sewers, with a design flow rate of 364L/d/person and a population density of 3 persons/unit for townhouses and stacked townhouses.

Sanitary servicing for the proposed development will consist of two 200mm diameter connections. Through discussions with the Region, the subject site shall release as much sanitary flows to the future sanitary sewer on Four Seasons Lane as possible. However, due to the relative depth of this sanitary sewer (driven by the sanitary sewer design by GHD and ultimate outfall to Dersan Street) to the

topography of the subject site, sanitary flows by gravity will not be possible for the townhouse blocks fronting Brock Street. The remaining townhouse blocks that cannot be drained by gravity to the Four Seasons Lane sewer will be designed on a second sanitary sewer line to be released into the existing 250mm sanitary sewer located within the Brock Road North right-of-way.

The total peak sanitary flow (including the infiltration allowance) for the portion of the site connecting to the existing sanitary sewer located within Brock Road North has been calculated as **S.3L/s**. This increased flow of 4.5L/s represents a 10.8% of the total pipe capacity of the existing 250mm sanitary sewer. It is expected that this additional flow can be accommodated within the existing sanitary sewer without the need for external upgrades.

The total peak sanitary flow (including the infiltration allowance) for the portion of the site connecting to the future sanitary sewer located within Four Seasons Lane has been calculated a **4.7L/s** this represents 7.8% of the total usage of the future 300mm sanitary sewer. The sanitary demand calculations completed by GHD indicate that the future sanitary sewer was designed to accommodate a total area of 2.25ha with a population of 704 people resulting in a total flow rate of 11.9L/s. The proposed design results in a decrease to the allocated flow of 7.1L/s, therefore the proposed development can be accommodated within the future sanitary sewer.

4. Water Servicing

4.1. Existing Water Servicing

The existing site servicing details obtained from the Region of Durham engineering plan and profiles and a topographical survey completed of the area indicate that there is future watermain infrastructure in the vicinity of the site. It is understood that the 400mm watermain on Brock Road is stubbed at either ends of the Brock Zents property (at the corner of Brock and Zents, and the northern end of the Lebovic lands). Through discussions with the Region, the applicant is required to carry out the design and construction for the completion of this watermain which the development will connect to.

Refer to the Servicing Drawing (S1) for the location of the existing watermain infrastructure.

4.2. Proposed Water Servicing

The proposed water service connections will be made to a future 200mm fire stub and 50mm domestic stub provided to the subject site in the northeast corner off the future 400mm diameter watermain located within the Brock Road North right-of-way. The connection will consist of a designated meter building (designed by others) which holds the bulk water meter and backflow assemblies as per Region Std S-240.041. Each townhouse unit will have a 13mm service connection from this main.

Based on the Fire Underwriters Survey and under proposed conditions the development is anticipated to have a maximum required fire flow demand of **2S0L/s** for the largest townhouse block within the subject site. The average day, peak hour, and maximum day domestic flows for the development under proposed conditions has been calculated as **2.SL/s, 9.4L/s, and 3.7L/s,** respectively. The maximum day + fire flow demand is thus **2S9.4L/s**.

A fire hydrant flow test will be completed during detailed design stage in order to further size the internal watermain network and verify that the existing 400mm watermain can meet the flow demands of the subject site while maintaining the minimum pressure requirements for all demand scenarios.

The water demand calculations are shown in **Appendix C** and the proposed and existing watermain infrastructure are shown on the Servicing Drawing (S1).

4.3. Fire Hydrant Coverage

There are two existing fire hydrants and two future fire hydrants located on the west side of Brock Road North located adjacent to the subject site. The proposed development will also have several hydrants located within the site such that the Building Code requirement for a hydrant to be located within 90 meters of all building faces.

5. Conclusion

The proposed development will see the construction of 17 townhouse blocks with a total of 195 3-storey townhouses at 2680 Brock Road North in the City of Pickering. The proposed development can be serviced utilizing the existing and proposed infrastructure outlined in the **Servicing Drawing (S1)**. Our conclusions and recommendations for servicing of the proposed development is summarized as follows:

Stormwater Servicing

- The proposed development will control the 2-year post-development storm flows to 6.91L/s/ha to the clean water collector pipe on Brock Road.
- All storm events above the 2-year storm will spill to Brock Road and ultimately conveyed to SWM Facility #4
- The Hydro-Brake Flow Control device has been specified to achieve the allowable flow rate of 11.1L/s at 2.64m of head
- The proposed development site stormwater drainage will have no adverse impact to the downstream sewer infrastructure as the requirements of the DH ESP is met.
- Stormwater quality will be achieved primarily through an Oil-Grit Separator located directly downstream of the chamber.
- Under post-development conditions it is expected that stormwater runoff will have had an improvement in quality and quantity as compared with predevelopment condition.

Sanitary Servicing

- The anticipated peak sanitary peak flow for the proposed development to Brock Road North is 5.3L/s.
- The anticipated peak sanitary peak flow for the proposed development to Four Seasons lane is 4.7L/s
- It is expected that this additional flow to the Brock Road North sanitary sewer can be accommodated within the existing sanitary sewer without the need for external upgrades.
- The sanitary demand calculations completed by GHD indicate that the future sanitary sewer was designed to accommodate a total flow rate of 11.9L/s, therefore the proposed design can be accommodated within the future sanitary sewer.

Water Servicing

- The average day, peak hour, and maximum day domestic flows for the development under proposed conditions has been calculated as 2.5L/s, 9.4L/s, and 3.7L/s, respectively.
- The calculated total fire flow demand was calculated as 250L/s for the largest townhouse block on the subject site using the Fire Underwriters Survey.
- A fire hydrant flow test will be scheduled during detailed design stage in order to verify that the existing 400mm watermain can meet the flow demands of the subject site while maintaining the minimum pressure requirements
- Additional confirmation of the fire and domestic branch sizing and fire flow requirements

should be provided by the Mechanical Consultant at the Building Permit stage of approval.

Recommendations

The following recommendations are presented:

- The contractor shall locate and verify all dimensions, levels, inverts, and datums onsite and report any discrepancies oromissions to the engineer prior to construction.

In summary, the site can be adequately serviced in respect to water supply, sanitary drainage, stormwater drainage, and stormwater management.

Accordingly, we hereby recommend the adoption of this report as it relates to the provision of servicing works, and for the purposes of site plan application, and building permit application approvals. We trust that this Functional Servicing and Stormwater Management Report is sufficient for your purposes. If you have any questions or comments, please do not hesitate to contact the undersigned.

Sincerely,

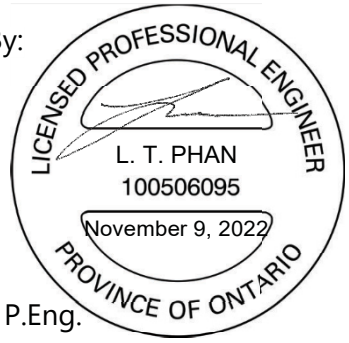
TYLin

Prepared By:

Vinci Patrick,

E.I.T, Urban Development

Reviewed By:



Luan Phan, P.Eng.

Project Engineer, Urban Development

Appendix A

STORMWATER CALCULATIONS

HYDRO-BRAKE OPTIMUM DESIGN

OIL-GRIT SEPARATOR DESIGN

TYLin

Project: **Brock Zents Townhomes**
Task: **Runoff Coefficients**
Date: **October 3, 2022**

Prepared by: **V.P. / L.P.**
Checked by: **L.P. / B.D.**
Project no.: **18138**

Post-Development Site Statistics (to Brock Road North Clean Water Collector Pipe)

	Area (m^2)	**Runoff C**
Landscape	4600	0.25
Impervious	10412	0.95
Roof	10500	0.95
Total	25512	

Total Combined Runoff C = 0.82
% Imperviousness = 82%

Duffin Heights Environmental Servicing Plan & Stormwater Management Facility #4 Requirements

Unit Discharge Rate for Site = 6.91 L/s/ha

	Catchment Outlet		
	Brock Road	Four Seasons Lane	Total
Total Catchment Area (ha)	2.55	0.08	2.63
Allocated Release Rate (L/s)	**17.63**	0.55	18.18
Uncontrolled Area (ha)	0.11	0.08	
Uncontrolled Flow (L/s)	6.15		
Adjusted Allocated Release Rate (L/s)	**11.48**		

TYLin

Project:	**Brock Zents Townhomes**	Prepared by:	**V.P. / L.P.**
Task:	**2 Year Storage Required**	Checked by:	**L.P. / B.D.**
Date:	**October 3, 2022**	Project no.:	**18138**

			Total Site	
2 Year		Runoff Coeff. (C):	0.82	
a	715.076	Drainage Area (A):	2.55	ha
b	5.262	Orifice Flow :	11.5	L/s
c	0.815		0.011	m^3/s

TIME	i	Inflow	Flow	Max Stor	
	2-year	CIA/360	Stored	Required	
minutes	(mm/hr)	(m^3/s)	(m^3/s)	(m^3)	
10	77.6	0.453	0.441	264.8	
15	61.6	0.359	0.348	313.2	
20	51.4	0.300	0.289	346.6	
25	44.4	0.259	0.248	371.6	
30	39.2	0.229	0.217	391.3	
35	35.2	0.205	0.194	407.3	
40	32.0	0.187	0.175	420.6	
45	29.4	0.171	0.160	431.9	
50	27.2	0.159	0.147	441.6	
55	25.3	0.148	0.136	450.1	
60	23.7	0.139	0.127	457.5	
65	22.3	0.130	0.119	464.1	
70	21.1	0.123	0.112	469.9	
75	20.1	0.117	0.106	475.2	
80	19.1	0.111	0.100	479.8	
85	18.2	0.106	0.095	484.0	
90	17.4	0.102	0.090	487.8	
95	16.7	0.098	0.086	491.2	
100	16.1	0.094	0.082	**494.3**	max
105	15.5	0.090	0.079	489.3	
110	14.9	0.087	0.076	484.4	
115	14.4	0.084	0.073	474.7	
120	14.0	0.081	0.070	465.3	
125	13.5	0.079	0.067	446.6	

YYLin

Project: **BrockZents Townhomes**
Task: **Orifice Sizing Calculations**
Date: **April 19, 2022**

Prepared by: **V.P. / L.P.**
Checked by: **L.P. / B.D.**
Project no.: **18138**

Orifice Equation: $Q = C \times A \times \sqrt{2gh}$

Orifice Size =	75	mm	
Orifice Area =	0.0044	m^2	
Allowable Release Rate =	11.48	L/s	
Discharge Coefficient =	0.62		
Head =	**0.90**	m	
Orifice Flow =	0.011	m3/s	
	11.48	L/s	
Storage Requirement =	494.3	m^3	
Approximate Tank Footprint =	**S7S.0**	m^2	*assuming 96% void space*

Achieving the required storage and allowable release rate would require a tank footprint of approximately S63.3m2, which is not feasible for this site. Therefore, a HydroBrake flow regulator will be used to optimize storage through available height.

Flow Regulator Design Parameters

Design Flow =	11.48	L/s	
Design Head =	2.64	m	
Storage Requirement =	494.3	m^3	
Approximate Tank Footprint =	**19S.0**	m^2	*assuming 96% void space*

Refer to Hydrobrake design calculations in this Appendix for further details

TYLin	Project:	**Brock Zents Townhomes**	Prepared by:	**V.P. / L.P.**
	Task:	**TSS / Quality Control Calculations**	Checked by:	**L.P. / B.D.**
	Date:	**October 3, 2022**	Project no.:	**18138**

OGS TSS Removal (B) = 50%

Land Type	Treated / Untreated	Area (m^2)	TSS Rem. (A)	TSS Rem. with Oil Grit Separator (R)
Roof	Treated	10,500	100%	100%
Landscape	Treated	4,600	100%	100%
Impervious	Treated	10,412	0%	50%
TOTAL		25,512	**S9%**	**80%**

NJDEP Calculation for TSS removal rates for BMP in Series:
R = A + B - [(AxB)/100]
A = TSS Removal rate from First (Upstream BMP)
B = TSS Removal rate from Second (Downstream BMP)

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.640	11.500
Flush-Flo™	0.573	9.978
Kick-Flo®	1.179	7.866
Mean Flow		9.274

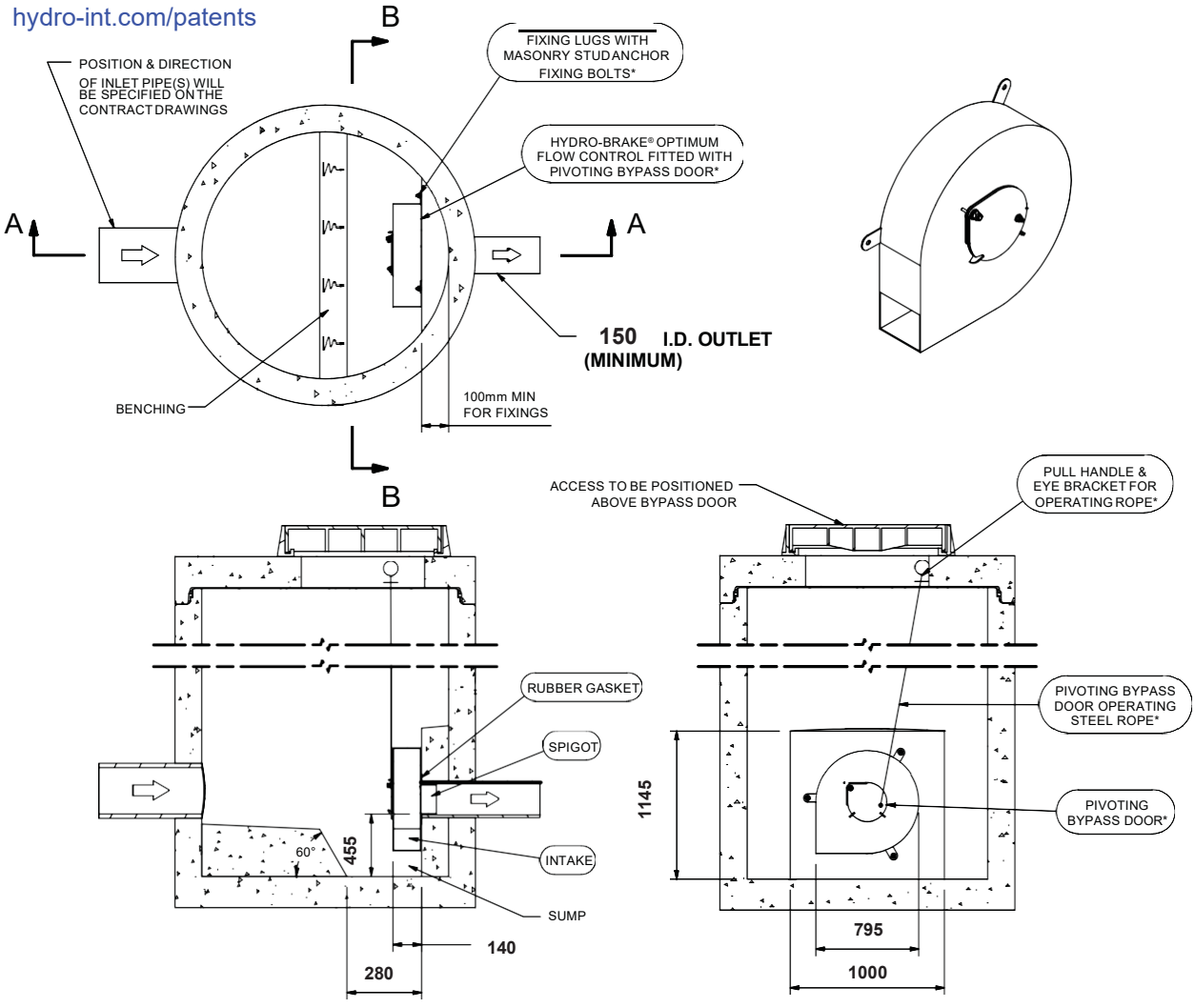
Hydro-Brake® Optimum Flow Control including:

- **5 mm** grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet
- nd cat ve We ght: 497 kg

BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 08/4598

WRc Approved PT/329/0412

hydro-int.com/patents



SECTION A-A

SECTION B-B

IMPORTANT: (oval) LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE

The head/flow characteristics of this SHE-0131-1150-2640-1150 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

DATE	10/3/2022 3:49 PM
SITE	Brock Zents TH
DESIGNER	**Lu Phan**
REF	

SHE-0131-1150-2640-1150

Hydro-Brake® Optimum

© 2022 Hydro International Ltd, 94 Hutchins Drive, Portland, Maine, 04102-1930. Tel; +1 (207) 756 6200 Fax; +1 (207) 756 6212 Web; www.hydro-int.com Email; enquiries@hydro-int.com

luantruongphan@gmail.com

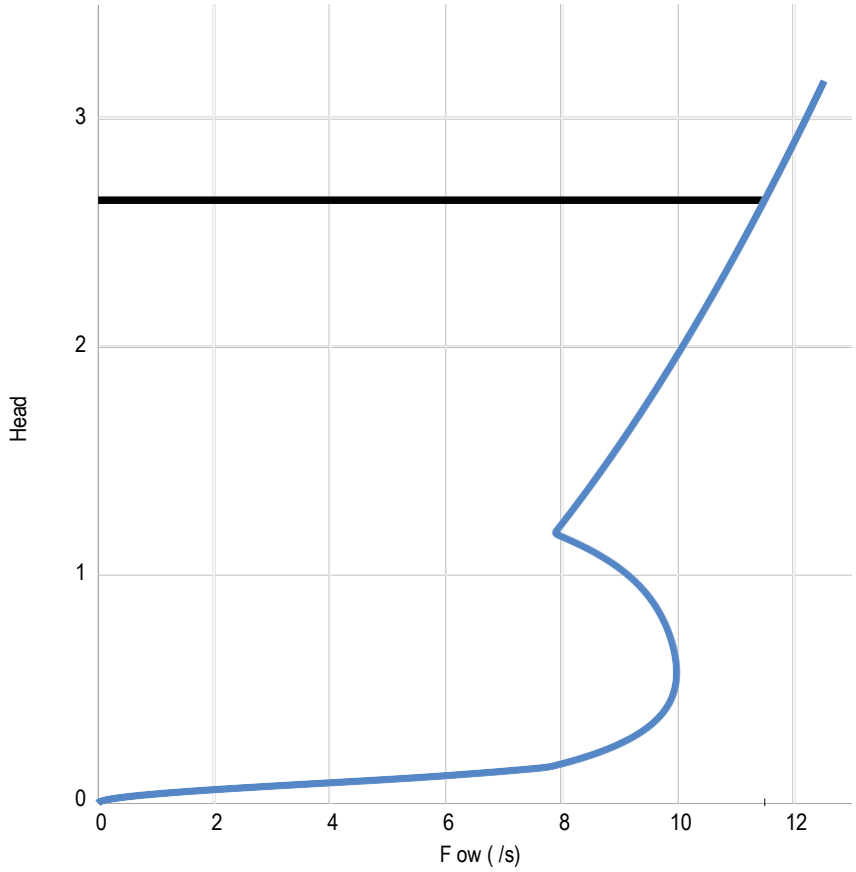
Technical Specification

Contro Point	Head (m)	F ow (/s)
Primary Design	2.640	11.500
F ush-F o	0.573	9.978
Kick-F o®	1.179	7.866
Mean F ow		9.274

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412

hydro-int.com/patents



Head (m)	F ow (/s)
0.000	0.000
0.091	4.112
0.182	8.140
0.273	9.104
0.364	9.628
0.455	9.885
0.546	9.974
0.637	9.957
0.728	9.867
0.819	9.714
0.910	9.480
1.001	9.126
1.092	8.599
1.183	7.893
1.274	8.159
1.366	8.427
1.457	8.686
1.548	8.937
1.639	9.180
1.730	9.417
1.821	9.647
1.912	9.871
2.003	10.090
2.094	10.304
2.185	10.513
2.276	10.718
2.367	10.918
2.458	11.115
2.549	11.308
2.640	11.498

DESIGN ADVICE

The head/f ow characteristics of this SHE-0131-1150-2640-1150 Hydro-Brake Optimum® F ow Contro are unique. Dynamic hydrau ic mode ing eva uates the fu head/f ow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International®

DATE	10/3/2022 3:49 PM
Site	Brock Zents TH
DESIGNER	Lu Phan
Ref	

SHE-0131-1150-2640-1150

Hydro-Brake Optimum®

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Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/29/2022

Province:	Ontario
City:	Pickering
Nearest Rainfall Station:	
Climate Station Id:	6158355
Years of Rainfall Data:	20
Site Name:	Brock Zents TH
Drainage Area (ha):	
Runoff Coefficient 'c':	0.82
Particle Size Distribution:	
Target TSS Removal (%):	
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	67.56
Oil / Fuel Spill Risk Site?	No
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	11.50
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Brock Zents TH
Project Number:	18138
Designer Name:	Luan Phan
Designer Company:	TYLin
Designer Email:	luan.phan@tylin.com
Designer Phone:	289-902-0326
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	49
EF6	55
EF8	61
EF10	65
EF12	69

Recommended Stormceptor EF Model: EF8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 61

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

► **Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

► **Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

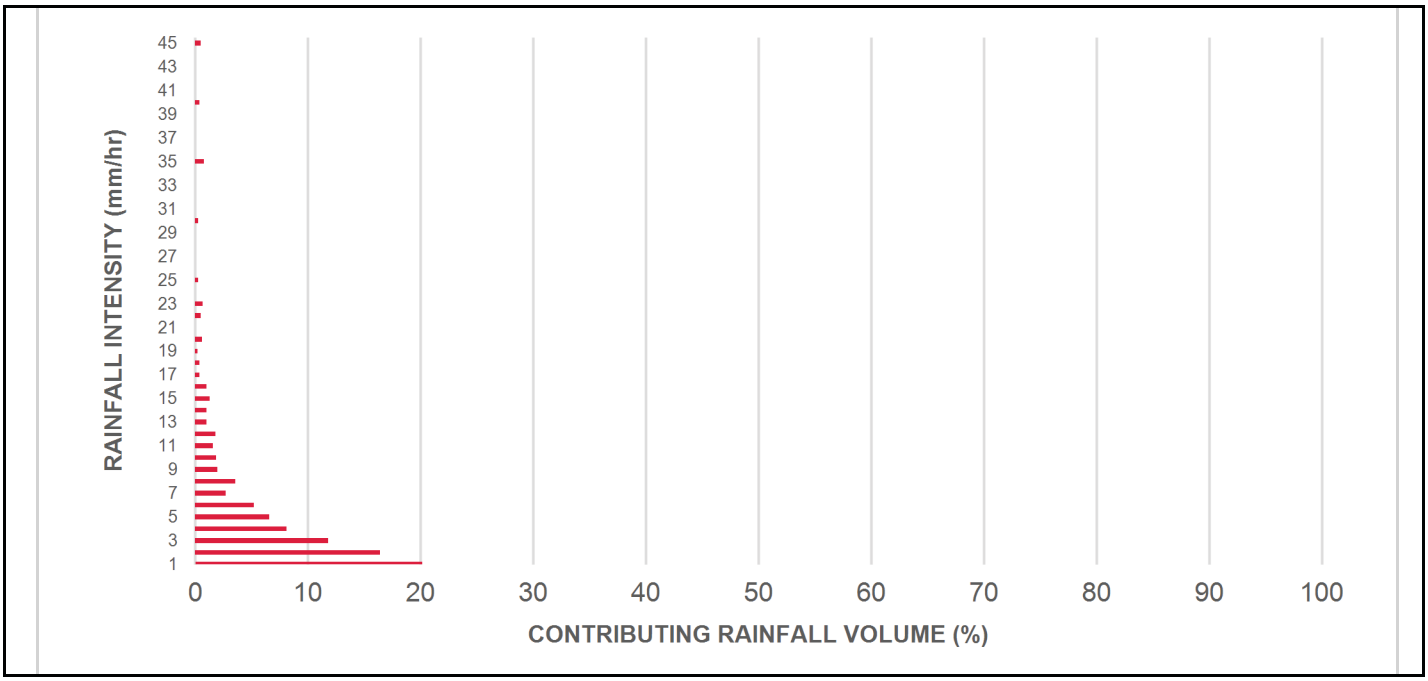
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

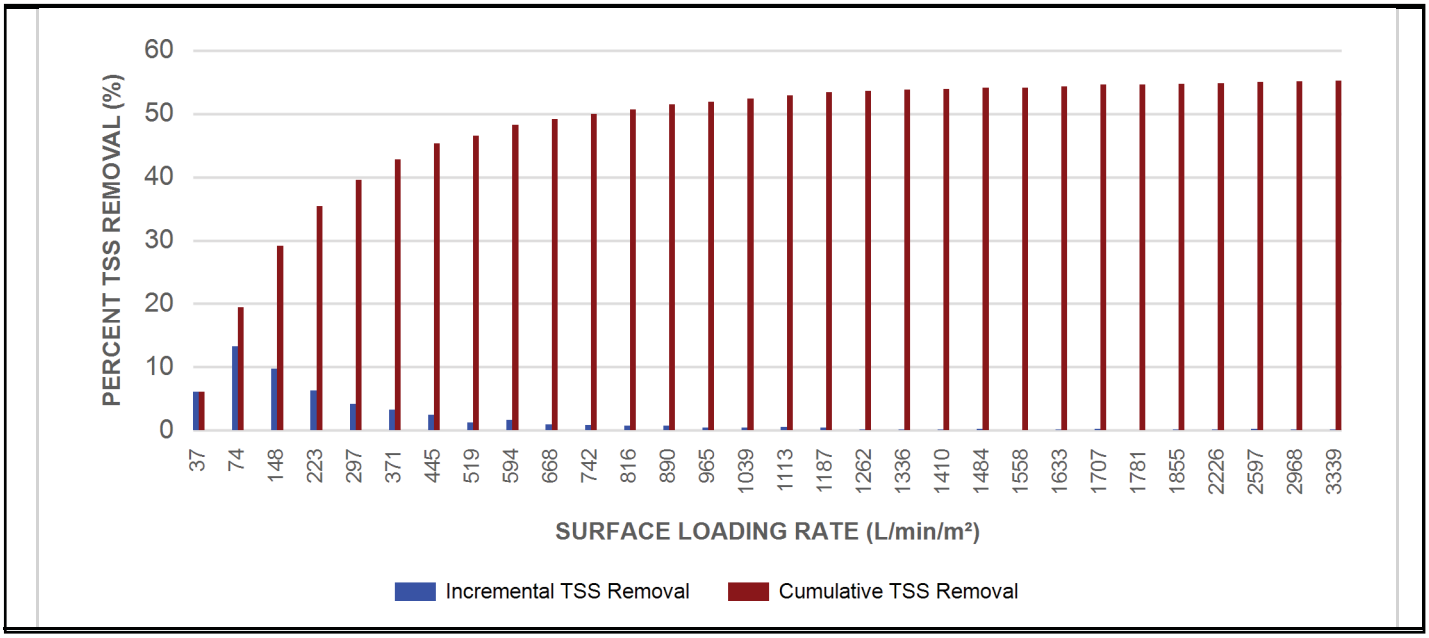
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.7	8.7	2.91	174.0	37.0	70	6.1	6.1
1	20.2	28.9	5.81	349.0	74.0	66	13.3	19.4
2	71.1	100.0	11.63	698.0	148.0	59	41.9	61.3
3	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
4	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
5	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
6	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
7	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
8	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
9	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
10	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
11	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
12	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
13	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
14	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
15	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
16	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
17	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
18	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
19	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
20	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
21	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
22	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
23	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
24	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
25	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
30	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
35	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
40	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
45	0.0	100.0	12.00	720.0	153.0	58	0.0	61.3
							Estimated Net Annual Sediment (TSS) Load Reduction =	**61 %**

Climate Station ID: 6158355 *Years of Rainfall Data*: 20

RAINFALL DATA FROM TORONTO CITY RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

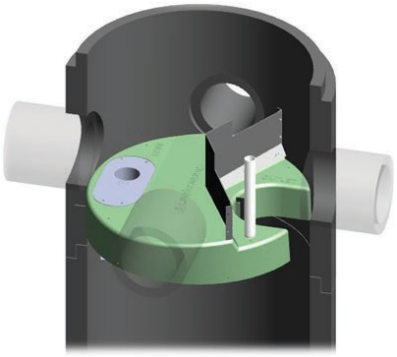
► **Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

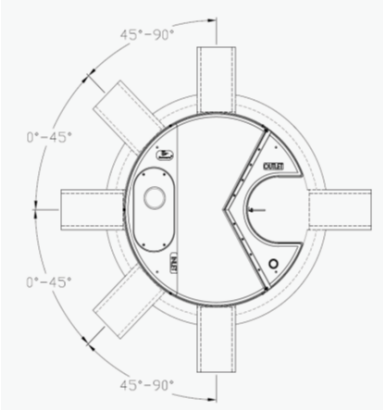
DESIGN FLEXIBILITY

► **Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

► While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.





INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EF

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	46	1320	48	1980	35
30	70	690	46	1350	48	2010	34
60	67	720	45	1380	49	2040	34
90	63	750	45	1410	49	2070	33
120	61	780	45	1440	48	2100	33
150	58	810	45	1470	47	2130	32
180	56	840	45	1500	46	2160	32
210	54	870	45	1530	45	2190	31
240	53	900	45	1560	44	2220	31
270	52	930	44	1590	43	2250	30
300	51	960	44	1620	42	2280	30
330	50	990	44	1650	42	2310	30
360	49	1020	44	1680	41	2340	29
390	48	1050	45	1710	40	2370	29
420	48	1080	45	1740	39	2400	29
450	48	1110	45	1770	39	2430	28
480	47	1140	46	1800	38	2460	28
510	47	1170	46	1830	37	2490	28
540	47	1200	47	1860	37	2520	27
570	46	1230	47	1890	36	2550	27
600	46	1260	47	1920	36	2580	27
630	46	1290	48	1950	35		

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The **minimum** sediment & petroleum hydrocarbon storage capacity shall be as follows:

4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

Appendix B

SANITARY CALCULATIONS

Pro ect ame
Pro ect
Sanitary Ser icing nalysis

TYLin

Prepared by eP
Checked by LP, D
Date September 30, O

Standards The Regional Municipality of Durham

Formulas
Peaking Factor(Harmon) = + [+(P 000)]
Peak Flow = p(q)M(unit conversion) + infiltration

Existing Sanitary Design Flow - Outlet to Brock Road North

Infiltration llowance	O				. m3 ha day		0.
Single Family Dwelling		nits	3. Persons unit		3 L day person	3. 0	0.

Proposed Sanitary Design Flow - Outlet to Brock Road North

Infiltration llowance					. m3 ha day		0.3
Townhouses Stacked Townhouses		O nits	3 Persons unit	3	3 L day person	3. 0	.

Proposed Sanitary Design Flow - Outlet to Four Seasons Lane

Infiltration llowance	3				. m3 ha day		0.3
Townhouses Stacked Townhouses		nits	3 Persons unit	3	3 L day person	3. 0	.3

Summary

ng Sanitary Design Flow - Outlet to	rock Road orth =	0. L s
ed Sanitary Design Flow - Outlet to	rock Road orth =	.3 L s
	Increased Flow =	. 3 L s

R N

Service Connection	Diameter (m)	Slope ( )	eelocity (m s)	Full Flow Capacity (L s)	Spare Capacity sage (L s)	Increased ( )	Total sage ( )
Residential	00	0.	0.	3.	.	-	.
Service Connection	0	0.	0.	.O	3 .	0.	.

S

Service Connection	Diameter (m)	Slope ( )	eelocity (m s)	Full Flow Capacity (L s)	Spare Capacity sage (L s)	Increased ( )	Total sage ( )
Residential	00	0.	0.	3.	.	-	.
Service Connection	300	0.	0.	.3	3.0	-	.

Notes

. The proposed development is an increase of . 3 L s of peak sanitary flow to the downstream sanitary sewer system.
. This increase is equal to 0. of the total pipe capacity of the minimum municipal sanitary sewer.
3. This flow is equal to . of the total pipe capacity of a 00mm diameter service connection.

Appendix C

WATER DEMAND CALCULATIONS

TYLin

Brock Zents
18138
Required Fire Flow

Prepared by: **V.P.**
Checked by: **L.P.**
Date: **November 8, 2022**

as per Fire Underwriters Survey Water Supply for Public Fire Protection, 2020

1. Initial Required Fire Flow (Step A, B, C)

Construction Type = Type II Noncombustible Construction
Construction Coefficient, C = 0.8
Total Effective Area, A = 1830 m^2

Required Fire Flow, RFF = 7529.0 LPM
RFF, rounded = 8000 LPM

2. Occupancy and Contents Adjustment Factor (Step D)

Contents = Noncombustible contents
Adjustment Factor = -25%
RFF = 6000 LPM

3. Automatic Sprinkler Protection (Step E)

Sprinkler Design	Designed	Building Coverage	Credit
Automatic sprinkler protection designed and installed in accordance with NFPA 13	No	100%	0%
Water supply is standard for both the system and Fire Department hose lines	No	100%	0%
Fully supervised system	No	100%	0%
	Total Sprinkler Credit =		0%

Reduction = 0 LPM

4. Exposure Adjustment Charge (Step F)

Direction	Distance	Charge
North	0m to 3m	25%
South	0m to 3m	25%
East	20.1m to 30m	10%
West	Greater than 30m	0%

Total Charge = 60%
Charge = 3600 LPM

5. Final Required Fire Flow (Step G)

RFF = 6000 LPM
Reduction = 0 LPM
Charge = 3600 LPM
RFF = 9600 LPM

Final RFF, rounded = 10000 LPM
2642 GPM
167 L/s

TYLin

Brock Zents
18138
Domestic Demand

Prepared by: **V.P.**
Checked by: **L.P.**
Date: **November 8, 2022**

as per Region of Durham Design Guidelines

Population =	585	
Per Capita Demand =	364	L/cap/day
Average Daily Demand =	212940	L/day
	2.46	L/s

	Average Day	Peak Hour	Maximum Day	
Peaking Factor	n/a	3.80	1.50	
Demand	**2.46**	**9.37**	**3.70**	**L/s**
	39.06	148.45	58.60	GPM

= L s
x = 3. 0 L s
=

Major Losses - DOMESTIC

S					V	H R	S	H	H
	0	0.00 0	3 .	3. 0	.	0.0	0.0	3. 0	.
	0	0.00 0	.	.	0.	0.0	0.0	.	.
3	0	0.00 0	3 .	.	.0	0.0	0.03	.	.
								j	=

Major Losses - FIRE

S					V	H R	S	H	H
	00	0.03	3 .	.	.3	0.0	0.	. 0	.
	00	0.03	.	0.	.	0.0	0.03	.	.
3	00	0.03	3 .	.	.	0.0	0.0	.	.
								j =	6

N : b %

Flow Test Results & Ser icing Hydraulic nalysis

	Pressure (psi)	***Flow (Lis)***	
		0	*Static Pressure available for site per Region correspondence*
Residual Pressure with losses (domestic) =		***45.5***	psi
Residual Pressure with losses (fire) =		***37.5***	psi
Minimum Required =		***20.3***	psi

Appendix C

Appendix D

SUPPORTING DOCUMENTATION

the Cougs (Tillings) Subdivision. For the remaining development parcels, including the City of Pickering lands west of Tillings Road, the Mixed Use Corridor west of Brock Road and south of Dersan Street, and the medium density lands north of Old Taunton Road assumptions have been made with respect to the percentage of the drainage area that can potentially be infiltrated either through the use of Low Impact Development measures (LIDs), or at an infiltration facility. No infiltration has been assumed for the Mixed Use Corridor north of Dersan Street and west of Brock as these flows must be conveyed to the Tributary Branch 2 of Urfe Creek to maintain baseflows. The drainage areas and assumptions for infiltration are presented in Figure WB-3 and WB-4 and Appendix A.

In this post development scenario with mitigation measures, soil moisture balance calculations were completed to assess how much water could potentially infiltrate in areas where extra runoff water is directed to vegetated areas, for example, where roof water is directed to grass. Tables A.6 and A.7 have factored in a change in slope for the lawns; shorter rooting depth; addition of roof captured rainwater (minus evaporation from roof); and 10% reduction in infiltration from compaction. The resultant infiltration and runoff factors have been applied in the post-development water balance with mitigation analysis presented in Tables 1.5 and 1.6.

As shown on Tables 1.5 and 1.6, post-development water balance calculations using selected mitigation techniques demonstrate that it is possible to exceed recharge targets in Ganatsekiagon Creek and maintain 92% of the pre-development infiltration in Urfe Creek. Site specific soil and water table conditions should be assessed at the draft plan of subdivision stage to evaluate the feasibility of, and opportunities for, augmenting groundwater infiltration and reducing runoff to determine the type, location and size of such measures. Again, it should be noted that existing infiltration volumes are over estimated here due to the assumption of almost 100% pervious surfaces under existing conditions.

Additionally, it is interesting to note that there is a 10 ha decrease in surface drainage area in Urfe Creek subwatershed and a corresponding 10 ha increase in Ganatsekiagon Creek under post development conditions. Although it has been assumed that the groundwater system follows the surface water system and there is a divide between Ganatsekiagon and Urfe Creeks, if infiltration is looked at comprehensively for all of Duffin Heights, there is only a 5% decrease in infiltration between post and pre.

quantity, quality and erosion control for these lands by the two proposed SWM facilities (SWM facility #3 and SWM facility #4).

Due to the diversion of drainage and in the absence of an end-of-pipe facility for the drainage area to West Tributary Branch 1, special consideration is required to ensure that water quality is not compromised, post-development flows do not exceed pre-development peak flows, and a surface water balance is maintained. Lot-level and conveyance type controls are therefore required to provide the necessary stormwater management controls for sub-catchment 2322, as outlined below.

4.2.1.1 QUALITY CONTROL

Quality control measures will be required for the proposed impervious surfaces in the Mixed Use Corridor located north of Dersan Street and west of Brock Road (sub-catchment 2322) prior to the "dirty" flows combining with the "clean water" from the woodlot (sub-catchment 2324) and roof and foundation drains (portion of sub-catchment 2350). As agreed upon by both the City of Pickering and TRCA, an oil/grit separator is to be located on the west side of Brock Road, north of Dersan Street within the right-of-way (refer to Figure 6.2) and will be designed to provide a minimum 75% removal of total suspended solids from the runoff. The unit is to be installed and maintained by the City of Pickering.

To provide additional quality control for the Mixed Use Corridor north of Dersan Street and west of Brock Road and provide a "treatment train" approach for those lands draining to Urfe Creek West Tributary Branch 1, an enhanced grassed swale is required at the outfall to the watercourse. The swale is to be located on the lands owned by Mattamy (Brock Road) Limited, immediately north of the cemetery. The swale shall be designed to accommodate the drainage from the woodlot, the "clean" controlled flows from the Mixed Use Corridor west of Brock Road and the 1 ha of roof drainage from the Mixed Use Corridor east of Brock Road. The swale must be designed to provide an "Enhanced" level of quality control (80% TSS removal). Adaptive management principles are to be utilized in the design of the swale to ensure that, as with the end-of-pipe SWM facilities, the design can be modified to allow for future modifications.

4.2.1.2 EROSION CONTROL

In the absence of an end-of-pipe SWM facility to provide erosion control, it must be shown that the proposed drainage plan and SWM strategy will not cause erosion on Urfe Creek West Tributary Branch 1. As outlined in the Terms of Reference (refer to Appendix A), the erosion criteria is to be based on the field assessment of the affected streams to establish the critical sections and thresholds at which erosion will take place. The field assessment for West Tributary Branch 1 was completed by Geomorphic Solutions and the results are presented in the Erosion Analysis Report {Appendix J of the ESP). A continuous model was developed to show that the proposed SWM strategy does not cause an increase in downstream erosion based on the erosion thresholds determined through the field assessment. The continuous modelling and analysis of the erosion thresholds for Urfe Creek West Tributary Branch 1 are presented in the Erosion Analysis Report {Appendix J of the ESP).

The proposed SWM strategy for West Tributary Branch 1, as outlined above in Section 4.2.1, will result in a decrease in both the duration and incidence of erosive flows within the reaches studied. Any potential impacts of the proposed development on the affected reaches of Urfe Creek will therefore be mitigated.

4.2.1.3 QUANTITY CONTROL

On-site detention is required for quantity control of the drainage from the proposed development in the Mixed Use Corridor located north of Dersan Street and west of Brock Road (refer to Figure 6.2). The 2 year post-development flows from this area must be controlled to unit release rates to ensure that the pre-

3.2.2.1 MAIN BRANCH

Under preferred land use conditions, the total drainage area from the study area to the Main Branch of Urfe Creek will be 39.0 ha (sub-catchment 2350 on Drawing DA-3). This corresponds to a diversion of approximately 15.4 ha from Branch 1 of the West Tributary to the Main Branch. A SWM facility will be located adjacent to Urfe Creek, east of Brock Road and north of Dersan Street to service this area (refer to SWMF #3 on Figure 6.1).

As indicated in Stantec's preliminary proposed drainage plan (refer to Appendix B), approximately 15.4 ha will drain to a SWM facility located north of Rossland Road, east of the Main Branch. There is also a small area shown on this plan that will drain uncontrolled. For the purposes of the Duffin Heights model, the total area from Ajax A9 draining to the Main Branch of Urfe Creek has been assumed to be 16.4 ha. This facility is located outside of the study area and will discharge to the Main Branch downstream of Rossland Road. This area has been identified as Subcatchment 2341 and will correspond to a diversion of approximately 4.3 ha from Duffins Creek to Urfe Creek.

3.2.2.2 WEST TRIBUTARY

Under existing conditions there are two branches of the West Tributary denoted as Branch 1 (Catchment 23.2) and Branch 2 {Catchment 23.3), (refer to Drawing DA-2). Under the preferred land use conditions the storm drainage plan for the DH lands within the West Tributary is as follows:

- The existing woodlot located north of Dersan Street and east of Tillings Road, which is approximately 18.7 ha in size (not including the proposed roads), will drain east, as it does under existing conditions, towards the proposed north-south road west of Brock Road. These flows will be captured and conveyed via a "cleanwater" storm sewer pipe south along the proposed road, then east along Dersan Street towards Brock Road (refer to Figure 6.2). The flows will then be conveyed east along the northern limits of the cemetery, ultimately discharging to the existing watercourse on the east side of Brock Road within the cemetery lands. This drainage will be separate from the road drainage (i.e. new road proposed east of the woodlot, Dersan Street and Brock Road). As outlined in the Duffin Meadows Cemetery Stormwater Management Master Plan (Stantec, 2001), the downstream infrastructure (culverts and SWM facilities) has been designed to accommodate a pre-development drainage area of 47 ha. Refer to Section 4.2.1.4 for additional details.
- All drainage from Brock Road, the Mixed Use Corridor on the west side of Brock Road south of Dersan Street and the property located on the east side of Brock Road south of the cemetery (approximately 26.1 ha) will be conveyed via municipal infrastructure south along Brock Road to a proposed SWM Facility to be located south of the Hydro Corridor, discharging to Branch 2 of the West Tributary {SWMF #4). This corresponds to a diversion of approximately 16.0 ha from Branch 1 to Branch 2 during frequent storm events {less than the 2 year} (refer to Figure 6.3).
- Minor system drainage (2 year storm} from the Mixed Use Corridor on the west side of Broe Road north of Dersan Street will be collected via storm sewer and conveyed south within the Brock Road right-of-way towards Dersan Street. Quality and quantity controls will be required as outlined in Sections 4.2.1.1 and 4.2.1.3, respectively. The flows will combine with the "clean water" pipe and be conveyed east along the northern limits of the cemetery to West Tributary Branch 1. This drainage will be conveyed by a separate storm sewer from the Brock Road drainage. Major system flows (up to and including the 100 year storm event) from this **area** will be conveyed overland to Brock Road and conveyed south along the right-of-way discharging to SWM facility #4 (refer to Figure 6.3}.
- Until such time as the Mixed Use Corridor north of Dersan Street and west of Brock Road develops, the flows from the woodlot and Mixed Use Corridor will continue to drain east overland towards Brock Road. Under existing conditions, these flows are conveyed south via the roadside ditch and then east under Brock Road via an existing culvert to West Tributary Branch 1. The Brock Road reconstruction

development flows to the West Tributary Branch 1 are not exceeded under post-development conditions. The following table, Table 4.3, provides a summary of the unit release rates and storage required to control post-development flows to the Aquafor Beech unit release rates for this drainage area. This is to be accomplished on a site by site basis by providing on-site detention for the 2 year storm in the form of underground (tank or pipe), surface (parking lot or swales) or rooftop storage. All flows above the 2 year storm can spill to Brock Road. These flows will be conveyed overland south along Brock Road to SWM Facility #4. Details of the site specific stormwater management controls will be required as part of the FSSR for each development application.

TABLE 4.3: DRAINAGE AREA 2325 QUANTITY RELEASE RATES AND STORAGE REQUIREMENTS

Area (ha)	Return Period **(Year)**	Unit Discharge **(f/s/ha)**	**Storage Required** (m3/ha)
13.6	2	6.9	185

4.2.1.4 WATER BALANCE

In order to maintain flows to Urfe Creek West Tributary Branch 1, it is proposed to have "clean water" pipes to convey flows from sub-catchments 2324, 2322 and 9518 (a portion of sub-catchment 2350) to the water course, immediately north of the existing Cemetery. Section 3.2.2.2 outlines the proposed drainage to the "clean water" pipes, which are illustrated on Figure 6.2.

As requested by TRCA and the City of Pickering, a continuous surface water balance was completed for West Tributary Branch 1 to ensure that the proposed SWM plan will not impact the volume of stormwater contributing flow to this watercourse. The Total Water Surplus (or total runoff volume) was calculated on a daily, monthly and yearly basis for post-development conditions based on the proposed drainage area plan, for a dry, wet and average year (utilizing Oshawa precipitation data). The results are presented in Appendix F and on the enclosed CD.

Based on the proposed strategy, with the minor system drainage from the Mixed Use Corridor north of Dersan Street and west of Brock Road, along with the "clean water" from east of Brock Road and the woodlot being directed to Branch 1, there is on average a 1.5% decrease in monthly surface runoff volume to Branch 1. It can therefore be concluded that the diversion of 35.7 ha away from the West Tributary Branch 1 will not impact the aquatic environment with respect to surface runoff volume.

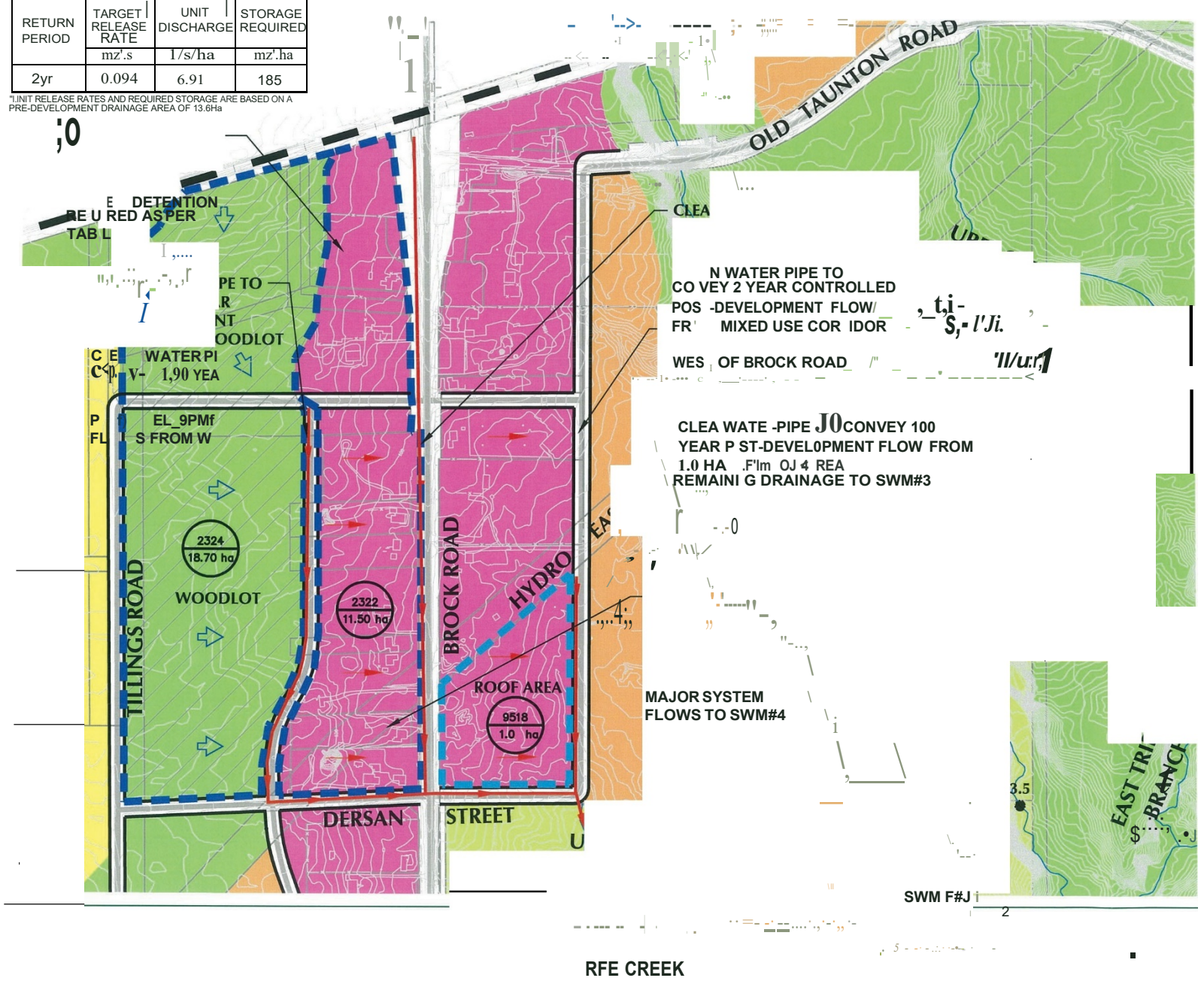
4.2.2 URFE CREEK EAST TRIBUTARY BRANCH 2 (SUBCATCHMENT 2371)

The area along the northern boundary of the Duffin Heights Neighbourhood, including Drainage Area 2371, has been identified in the Hydrogeological Study prepared by Beatty & Associates Limited as "the southern toe of the Iroquois shoreline deposit, a hydrologically sensitive area." Special consideration is therefore required for the development lands located in this area and more specifically, in the northeast corner of the Duffin Heights Neighbourhood, (Drainage Area 2371). Drainage Area 2371 consists of a 2.8ha parcel designated for medium density development.

End-of-pipe controls are not a viable SWM solution for these lands due to the fact that the amount of developable area within each drainage area is limited and also due to the location of these lands with respect to the watercourse. Lot level and conveyance controls are therefore very important for management of both surface water and groundwater resources based on this and the fact that this area has been identified as the Iroquois shoreline. A "treatment train" approach including on-site detention for quantity controls and infiltration measures for the water balance are required for the development of the lands within Drainage Area 2371.

RETURN PERIOD	TARGET RELEASE RATE	UNIT DISCHARGE	STORAGE REQUIRED
	mz'.s	1/s/ha	mz'.ha
2yr	0.094	6.91	185

*I.INIT RELEASE RATES AND REQUIRED STORAGE ARE BASED ON A PRE-DEVELOPMENT DRAINAGE AREA OF 13.6Ha



NHYD # DRAINAGE AREA

23.2 FLOW NODE

DRAINAGE BOUNDARY

ROOF DRAINAGE BOUNDARY

DUFFIN HEIGHTS BOUNDARY

WATERCOURSE

PROPOSED ROAD NETWORK

CLEAN WATER PIPE

MAJOR FLOW

DIRECTIONS

LOW DENSITY AREAS

MIXED USE CORRIDORS

MEDIUM DENSITY AREAS

OPEN SPACE

CEMETERY/ ACTIVE RECREATION

SE N- A.SSOCIA.TES

(A M•11bM² of The S<Jmas Group Inc.)

Duffin Heights Neighbourhood

POST DEVELOPMENT CONDITIONS
SWM DRAINAGE STRATEGY
URFE CREEK
WEST TRIBUTARY BRANCH 1

JAN. 2010 | 06154 | Figure 6.2

OF:IIK.NEDBY- A.K./T.M.
0E0CEDBY: A.K.
N.T.S.

WES!T TRIB TARY BRANCH-1 -

ON SITE DETENTION

RETURN PERIOD	TARGET RELEASE RATE	UNIT DISCHARGE	STORAGE REQUIRED
	m1/s	l s ha	m1/ha
2yr	0.094	6.91	185

•UNIT RELEASE RATES ANO REQUIRED STORAGE ARE BASED 0 N A PRE-DEVELOPMENT DRAINAGE AREA OF 13.6Ha

RETURN PERIOD	TARGET RELEASE RATE	UNIT DISCHARGE	STORAGE REQUIRED
	m1/s	l s ha	m1/ha
2yr	0.091	6.95	425
5yr	0.148	11.30	592
10yr	0.187	14.27	708
25yr	0.243	18.55	859
50yr	0.293	22.37	972
100yr	0.339	25.88	1088

•UNIT RELEASE RATES ANO REQUIRED STORAGE ARE BASED ON A PRE-DEVELOPMENT DRAINAGE AREA OF 1J.1Ha

C SITE DETENTION RE UIRED AS PER TABLE

CqEt N WATER PIPE TO C<j>NIVEY 100 YEAR P E-bEVELOPMENT WS FROM WOOO,m

CLEAN WATER PIPE TO CONVEY 2 YEAR CONTRO LLED" POST-DEVELOPMENT FLOW FROM MIXED USE CORRIDOR WEST OF BROCK ROAD

CLEAN WATER PIPE TO CONVEY 100 YEAR POST-DEVELOPMENT HOW FROM 1.0 HA OF ROOF ARE REMAINING DRAINAGETOSWM#3

URFE CREEK S T TRIBUTAR

URFE CREEK

WOODLOT

TILLINGS ROAD

BROCK ROAD

HYDRO EASEMENT

11.50 ha

MAJOR SYSTEM FLOWS TO SWM#4

OIL/GRIT SEPARATOR

DERSAN STREET

URFE CR EK

WES TRIB I TARY BRANCH

CORRIDOR

EXISTING CEMETERY

26.10 ha
1.97 ha

WEST TRIBUTARY BRANCH 1

WEST TRIBUTARY BRANCH 2

INLET

SWM

OUTLET

OUTLET

25.2

ROSSLAND ROAD

LEGEND:

- 16.70 ha / 1.50 ha — DRAINAGE AREA / POND BLOCK SIZE
- .23.2 — FLOW NODE
- CATCHMENT BOUNDARY OF PROPOSED SWM FACILITY #4
- MAJOR SYSTEM ONLY (72YR STORM)
- DUFFIN HEIGHTS BOUNDARY
- WA TERCOURSE
- OUTLET LOCATION
- PROPOSED ROAD NETWORK
- CLEANWATER PIPE
- MINOR FLOW DIRECTIONS
- MAJOR FLOW DIRECTIONS
- LOW DENSITY AREAS
- MIXED USE CORRIDORS
- MEDIUM DENSITY AREAS
- OPEN SPACE
- CEMETER Y/ACTIVE RECREATION

NAS 6.SSOCI.6.TES

Duffin Heights Neighbourhood

POST DEVELOPMENT CONDITIONS
SWM DRAINAGE AREAS
URFE CREEK SWM #4

A.K./I.M. PROJECT No 06154

FIGURE 6.3