BEAR CREEK VILLAGE
FUNCTIONAL SERVICING REPORT
ARDAGH ROAD/SUMMERSET DRIVE
CITY OF BARRIE

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January 29th, 2021
19-11476B – rev. 0

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1.0 INTRODUCTION

1.1 General

The proposed development site is located northeast of the Ardagh Road and Mapleton Avenue intersection. The property is legally described as Part Lot 2, Concession 14, in the City of Barrie, County of Simcoe.

The subject property is approximately 4.49 hectares in area and is currently vacant. There is no driveway currently available to access the property from Ardagh Road. The site is bounded by undeveloped forest area to the north and west, Bear Creek to the east, and Ardagh Road to the south. The location of the subject site is illustrated on Figure 1.

Currently, Jones Consulting Group Ltd. is in the process of extending Summerset Drive from the intersection of Summerset Drive and Wright Drive to the intersection of Ardagh Road and Mapleton Avenue. The proposed road will run along the north edge of the proposed site.

The developer is proposing construction of seventeen (17) blocks of back-to-back townhouses, totaling 218 residential units, and a 90-unit apartment building. Access to the development will be provided from Ardagh Road and Summerset Drive. Parking for the development will be provided by surface and underground garage parking for the apartment building, and on-grade parking garages beneath the townhouse blocks. Additional surface parking stalls are provided around the landscape amenity area. A stormwater management block is proposed at the northeast corner of the property. A reduced copy of the proposed site plan concept and parking lot layout plan prepared by Innovative Planning Solutions for the purposes of the rezoning application is included in Appendix A for additional information.

1.2 Purpose and Scope

Pinestone Engineering Ltd. (PEL) has been retained by the developer to provide professional engineering services related to the preparation of a Functional Servicing Report (FSR). This report has been prepared to support a Rezoning Application for the subject lands. The purpose of this report is to describe the existing servicing infrastructure in the vicinity of the site, and provide recommendations for the provision of sanitary drainage, water distribution, and storm water management in accordance with City of Barrie criteria.

2.0 REFERENCE REPORTS

The following reports and studies have been used for reference in the preparation of this Functional Servicing Report:

i) *City of Barrie Storm Drainage and Storm Water Management Policies and Design Guidelines, prepared by the City of Barrie Engineering Department, December 2020.*
ii) *City of Barrie Development Manual, prepared by the City of Barrie Engineering Department, December 2017.*

iii) *City of Barrie Water Supply Master Plan Update; Final Report prepared by WSP, 2019*

iv) *City of Barrie Wastewater Collection Master Plan Update; Final Master Plan Report prepared by Cole Engineering Group Ltd., 2019.*

v) *Ministry of the Environment Storm Water Management Planning and Design Manual, March 2003.*

vi) *Low Impact Development Manual prepared by Credit Valley Conservation and Toronto and Region Conservation, 2010.*

vii) *City of Barrie Infiltration Low Impact Development Screening Process, 2017.*

viii) *NVCA Stormwater Technical Guide prepared by the Nottawasaga Valley Conservation Authority, 2013.*

ix) *Erosion and Sediment Guidelines for Urban Construction prepared by the Greater Golden Horseshoe Area Conservation Authorities, 2006.*

x) *Meadows of Bear Creek Detailed Stormwater Management Report prepared by Jones Consulting Group Ltd., 2018*

3.0 EXISTING CONDITIONS

3.1 General

The subject site is approximately 4.49 hectares in area and is currently vacant. There is no driveway currently available to access the property from Ardagh Road. The site is located within the City's urban servicing area and municipal services are readily available for connection. Existing vegetation on the site generally consists of a coniferous plantation.

3.2 Topography

Based on a review of the topographic survey provided by JoeTOPO SURVEYS AND CADD INC., the property is relatively flat and generally slopes northerly towards Bear Creek at an average slope of 2.5%. Elevations across the site range between 242.60m ASL at the southeast corner of the site to 237.70m ASL at the northwest corner.

3.3 Site Geology

A preliminary test pit investigation was completed by Soil Engineers Ltd. in October 2017. Field work for this investigation consisted of seven test pits excavated to depths ranging from 1.8-2.7m below the ground surface. Based on our review of the report, the test pits reveal topsoil encountered over a deep layer of gravelly sand. An earlier geotechnical investigation was also completed by Geospec Engineering Ltd. in April 2012. The borehole logs revealed topsoil encountered over a deep layer of sand with traces of gravel and silt.

Groundwater monitoring, conducted in March 2012 for boreholes 2-6, revealed a groundwater elevation averaging 3.2m below the ground surface or approximately 236.77m ASL.

Based on our review of the soil descriptions outlined in the MTO Drainage Manual on Chart 1.08, we have classified the site material as a Type A under the Soil Conservation Service, hydrologic soil group.

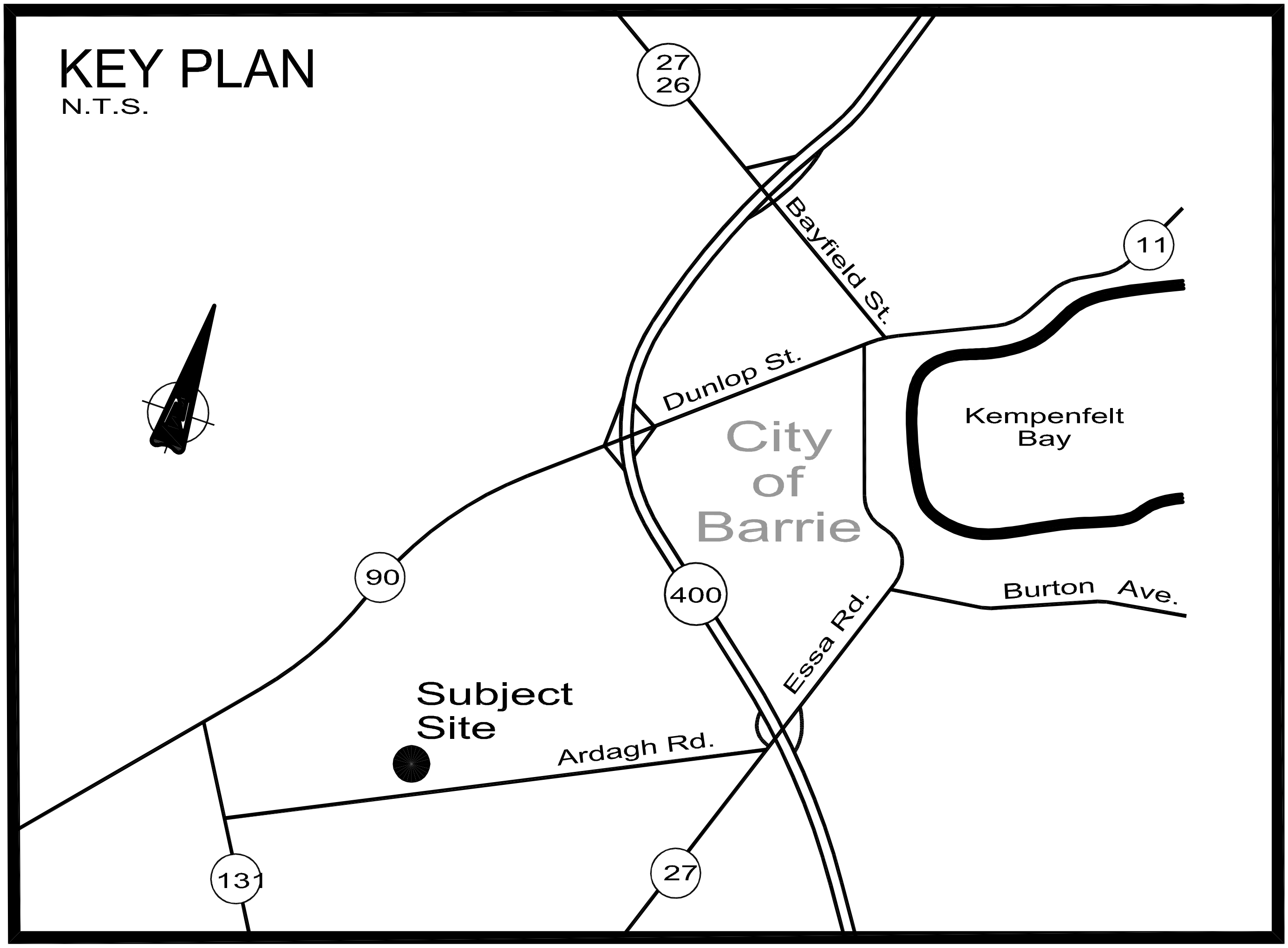
A copy of the preliminary test pit investigation completed by Soil Engineers Ltd., the geotechnical investigation, prepared by Geospec Engineering Ltd., and Chart 1.08 of the MTO Drainage Manual is included in Appendix B.

3.4 Drainage Conditions and Flood Plain Mapping

Drainage from the site is generally conveyed north in the form of overland sheet flow and ultimately outlets to Bear Creek.

The site is located within a Nottawasaga Valley Conservation Authority (NVCA) regulated area based on available mapping on their website. Accordingly, the receiving outlet should be considered “sensitive” and an “enhanced” level of quality control applied in accordance with the NVCA Stormwater Technical Guide (NVCA, 2013), the MECP Storm Water Management Planning and Design Manual (MECP, 2003), and the City of Barrie SWM Guidelines (City of Barrie, 2020).

Flood plain mapping for the site was previously completed as part of the Meadows of Bear Creek subdivision by Jones Consulting in October 2016. The flood plain analysis contemplates the proposed box culvert under Summerset Drive along with pre-development flowrates from the subject site. The regional flood line and erosion hazard limits, derived from the Jones Hazards Assessment Report, are shown on the conceptual engineering drawings included in Appendix E.



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BEAR CREEK VILLAGE

LOCATION PLAN

DATE:	SCALE:	PROJECT No.	FIGURE No.
JUNE 2020	N.T.S.	19-11476B	FIGURE 1

4.0 SANITARY SERVICING

4.1 Existing Sanitary Servicing

An existing 525mm diameter sanitary trunk sewer runs along the north side of the development, within the proposed Summerset Drive ROW extension, and conveys sewage easterly to the City of Barrie Wastewater Treatment Facility Pumping Station (Barrie WWTF PS10) located on Bradford Street. According to the information provided in the City of Barrie Wastewater Collection Master Plan (Cole Engineering, July 15th, 2019), the Barrie WWTF pumping station (PS10) has a firm capacity of 2205 L/sec and is currently operating around 1900 L/sec.

Based on our review of the existing wastewater collection performance assessments completed by Cole Engineering in the Wastewater Collection Master Plan, under 2019 conditions, no surcharging of downstream sanitary sewers from the subject site were noted. Under wet weather flow conditions for a 25-year storm event, the immediate downstream reach of trunk sewer experienced a peak conduit depth ratio (d/D) of greater than 0.7, but maintained a freeboard (distance between the ground surface and peak hydraulic grade line) of greater than 1.8m, indicating that there is no capacity issue and no surcharging conditions are predicted.

The development area will be serviced with a 250mm dia. sanitary lateral off the existing 525mm dia. trunk sewer underneath the proposed Summerset Drive ROW. The sanitary lateral is currently capped at property line.

4.2 Proposed Sanitary Flows

Contributing sanitary flows from the proposed development were calculated using City of Barrie design criteria for medium density residential/block townhouses, as follows:

- A residential average sewage flow of 225 litres/capita/day
- A residential population density of 2.34 persons/unit
- An extraneous flow rate of 0.1 litres/sec/ha
- A peaking factor based on Harmon's equation

With a total residential count of 308 townhouse/apartment units, the total population to be serviced is 721 persons based on the above distribution. Incorporating extraneous flows, the combined peak sewage flow generated by the proposed development is calculated to be approximately 7.63 L/sec. Detailed sanitary calculations are included in Appendix C.

A review of the existing capacity of the immediate downstream reach of 525mm diameter sanitary sewer along the proposed Summerset Drive ROW was completed. The existing reach of sewer has a conveyance capacity of approximately 136 L/sec and the proposed peak sanitary flows from the development represents approximately 5.6% of the total pipe capacity. Based on the total conveyance capacity of the immediate downstream reach of sewer, the existing infrastructure is expected to have the available capacity necessary to support the development without the need for external sanitary upgrades.

4.3 Proposed Sanitary Servicing

The proposed development will be serviced using a 250mm diameter service connection to the existing trunk sewer within the proposed Summerset Drive ROW. Servicing details will conform to City of Barrie standards and the exact size and location of the service lateral will be determined during detailed design to the support the Site Plan Application.

A conceptual servicing layout is provided on the attached drawings included in Appendix E.

5.0 WATER SERVICING

5.1 Existing Water Servicing

A 300mm diameter watermain exists along the north side of the proposed Summerset Drive ROW. The site is currently serviced by a 250mm diameter service stub that extends to property line off the 300mm diameter watermain.

For the proposed zoning amendment, onsite pressures and flows have been confirmed to ensure there is sufficient capacity available for both domestic and firefighting conditions.

We have utilized information obtained from the municipal hydrants in the vicinity of the subject site connected to the existing 300mm diameter watermain underneath the proposed Summerset Drive ROW (hydrants 2752 and 3396). Table 1 illustrates the flow results of the testing conducted by Vipond on September 22nd, 2020.

Table 1
Results of Hydrant Flow Tests

Test #	Outlet Inside Dia. (in.)	Number of Outlets	Residual Reading (PSI)	Flow@ Residual (gal/min)
0	n/a	n/a	91 (static)	n/a
1	1.75	1	75	695
2	2.5	1	80	954
3	2.5	2	70	1720

Refer to Appendix C for the flow testing information obtained by Vipond.

5.2 Proposed Water Demands

The subject site is located within water servicing Zone 2S. A per the City of Barrie Water Supply Masterplan (WSP, July 2019) domestic water demand for the development are listed in Table 2 below:

Table 2
Domestic Water Demand

Population	**Per Capita Flow (L/day)**	**Peaking Factors (based on MECP and City of Barrie Guidelines)**		**Flows (L/sec)**	
		Peak Hour	Maximum Day	Peak Hour	Maximum Day
721	129	2.25	1.75	2.42	1.88

Fire demands for the proposed development were calculated in accordance with the Fire Underwriters Survey (FUS) as follows:

$$F = 220C(A)^{0.5}$$

Where,

F = the required fire flow in litres per minute.
C = coefficient related to the type of construction.
A = total floor area of building (excluding basements)

Table 3
Water Requirements for Fire Fighting

Total Area (m^2)	**Coefficient "C"**	**Required Flow (L/min)**	**Require Flow (L/sec)**
4,135	0.8	11,318	189

The proposed 5-storey apartment building was chosen because it is the worst-case scenario for total floor area and building exposure charges.The total area represents 5 floors for a 827m^2 apartment building (827m^2 x 5), separated by a fire wall from the proposed 6-storey apartment building. The building is assumed to be of non-combustible construction equipped with a sprinkler system in conformance with NFPA standards. Based on the guidance provided in the FUS and applying the relevant reductions and charges in flow for construction type (-25%), sprinkler system (-30%), and exposure distances due to the proximity of the other proposed and existing buildings (+55%), the required fire flow for the development will be reduced to 177 L/sec. Detailed FUS calculations are provided in Appendix C.

5.3 Proposed Water Servicing

Using the calculated fire flow value of 177 L/sec for the apartment building, an analysis was completed to determine if the fire flow rate can be supplied to the proposed hydrant in the vicinity of the apartment building while maintaining a minimum operating pressure of at least 20 psi (138 kPa) per City of Barrie standards. The water demand flowrate analysis was completed using PIPE2008 modelling software by KYPIPE. The PIPE2008 software computes residual water pressures at selected junctions based on the available water supply and the proposed water demands. Based on the model results, the existing 300mm dia. watermain underneath the new Summerset Drive ROW has sufficient volume and pressure to service the proposed residential subdivision with fire and domestic flows. A 250mm dia. watermain will have the capacity to distribute a max day plus fire flowrate of 178.9 L/sec while maintaining a minimum residual pressure of 138 kPa throughout the system. The results of the water demand flowrate analysis are included in Appendix C.

It is important to note that the proceeding analysis considers only a radial feed from Ardagh Road to the subject site. It does not include the looped watermain connection back to the east through Bear Creek and to the existing subdivision. A looped connection is planned for early 2021 and we expect the looped connection will provide an overall benefit by increasing system pressures and volumes.

Servicing details will conform to City of Barrie standards and the exact size and location of the service laterals will be determined during detailed design to the support the Site Plan Application. A conceptual servicing layout is provided on the drawings included in Appendix E.

6.0 HYDROLOGY

6.1 Design Criteria

Based on a review of the NVCA's and City of Barrie's Storm Water Management (SWM) Guidelines, the following design criteria, in accordance with the current MECP SWM Planning and Design Manual (MECP, 2003) were established for the proposed development:

Quantity Control:

- Peak flow attenuation for the 2-year through 100-year storm events to pre-development rates using the City of Barrie's WPCC IDF parameters.

- Both the 4-hour Chicago and 24-hour SCS Type II storms must be modelled for the specified storm events.

- Safe conveyance of the Regulatory flows through the site to a sufficient outlet is required. The Regulatory flows are taken as the greater of the uncontrolled 100-year or Timmins flows through the development.

Quality Control:

- The City of Barrie requires that all new storm water management facilities provide, as a minimum, the "enhanced" level of protection in accordance with the MECP Storm Water Management Planning and Design Manual (MECP, 2003).

- Preparation of phosphorus and water balance calculations to meet City of Barrie and NVCA requirements.

- Preparation of detailed erosion, sediment control, and construction mitigation plan to be implemented as part of the construction program.

6.2 Design Storms

We have selected the following design storms as part of our evaluation:

- 2-year design storm
- 5-year design storm
- 10-year design storm
- 25-year design storm
- 50-year design storm
- 100-year design storm
- 12-hr Timmins Regional storm

Rainfall intensity - duration frequency (IDF) values for the Barrie Area were entered into an equation that expresses the time relationship intensity for specific frequency, in the form of:

$$i = \frac{a}{(t+b)^c}$$

where: i = intensity, mm/hr.
t = Time of concentration, minutes
a,b,c = constants developed to fit IDF curve

The rainfall runoff event simulation model OTTHYMO was used to simulate watershed response to design rainfall events. Derivation of the design storm hyetographs were based on the "Chicago" 4-hour distribution using the intensity, duration, frequency (IDF) data. In addition to the “Chicago” storms, the 24-hour SCS Type II storms and the 12-hour Timmins Regional storm were also modelled as required by the NVCA.

The design storm parameters for the Chicago distribution are outlined in Table 4 below. A copy of the IDF values taken from the City’s SWM guidelines is also included in Appendix D.

Table 4
Design Storm Parameters - Chicago Rainfall Distribution

Rainfall Event	Parameter		
	A	B	C
2 Yr	678.085	4.699	0.7810
5 Yr	853.608	4.699	0.7660
10 Yr	975.865	4.699	0.7600
25 Yr	1146.275	4.922	0.7570
50 Yr	1236.152	4.699	0.7510
100 Yr	1426.408	5.273	0.7590

6.3 Drainage Catchments

One (1) pre-development and two (2) post-development catchments have been delineated for the site in order to estimate the corresponding peak runoff rates for the site. The pre-development catchment area represents the existing condition of the proposed development area, which consists of coniferous plantation. The post-development catchments represent the proposed grading concept for the development area. The pre-development and post-development catchment parameters are included in Appendix D, and catchment boundaries are illustrated on drawings PRE-1 and POST-1 included in Appendix E.

6.4 Model Results

The results of the hydrologic modelling are displayed in Tables 5 and 6 below for the 12hr Timmins Regional Storm, and the 2-year to 100-year return frequency storm events for the 4hr Chicago distribution, and the 24hr SCS Type II distribution.

The pre-development flowrates from our hydrological modelling match the pre-development flowrates for the west lands in the Meadows of Bear Creek Detailed Stormwater Management Report, prepared by Jones Consulting, for the design of the box culvert on Summerset Drive.

Table 5
Model Results - 4hr Chicago and 12hr Timmins Regional Storm Distributions

	2Yr	5Yr	10Yr	25Yr	50Yr	100Yr	Timmins
PRE-DEVELOPMENT (m^3/sec)							
Catchment 101	0.007	0.016	0.024	0.037	0.047	0.059	0.102
Total Pre-Development Runoff Rate (m^3/sec)	**0.007**	**0.016**	**0.024**	**0.037**	**0.047**	**0.059**	**0.102**
POST- DEVELOPMENT (m^3/sec)							
Catchment 201	0.502	0.687	0.822	0.987	1.121	1.250	0.407
Catchment 202	0.005	0.010	0.014	0.020	0.024	0.029	0.023
Total Post- Development Runoff Rate (m^3/sec)	**0.506**	**0.695**	**0.833**	**1.003**	**1.141**	**1.274**	**0.430**

Table 6
Model Results - 24hr SCS Type II Storm Distributions

	2Yr	5Yr	10Yr	25Yr	50Yr	100Yr
PRE-DEVELOPMENT (m^3/sec)						
Catchment 101	0.016	0.036	0.052	0.077	0.097	0.121
Total Pre-Development Runoff Rate (m^3/sec)	**0.016**	**0.036**	**0.052**	**0.077**	**0.097**	**0.121**
POST- DEVELOPMENT (m^3/sec)						
Catchment 201	0.426	0.622	0.762	0.947	1.086	1.226
Catchment 202	0.010	0.019	0.026	0.036	0.044	0.053
Total Post- Development Runoff Rate (m^3/sec)	**0.435**	**0.640**	**0.787**	**0.981**	**1.128**	**1.276**

Based on the calculated results of the hydrological modelling, it is expected that post-development flows directed to Bear Creek will increase due to the proposed construction of the buildings and paved driveways. Visual OTTHYMO input/output calculations are included in Appendix D.

7.0 STORM WATER MANAGEMENT PLAN

7.1 Quantity Control

As noted in the comparison of the pre-development and post-development flows, an increase in runoff will occur due to the proposed construction of the buildings and paved surfaces. To satisfy the selected design criteria, peak flow attenuation of post-development flows to pre-development levels for all storm events up to and including the 100-year storm event will be provided by directing roof drainage and driveway/road runoff to the proposed infiltration basin at the northeast corner of the site.

Runoff generated in Catchment 201, which includes approximately 92% of the proposed development area, will be directed to the proposed infiltration basin. Lot line drainage swales constructed at minimum gradients of 2.0% will be provided to convey lot drainage to the roadway. Runoff from roads and surface parking facilities will be collected by a proposed storm sewer system which will convey drainage downgradient to the SWM block proposed in the northeast portion of the property.

The basin design includes approximately 3006m^3 of extended detention storage with embankment slopes of 3:1, and an emergency overflow weir. The infiltration basin is sized to attenuate stormwater generated from design storm events up to and including the 100-year Chicago and SCS Type II storm event. The bottom of the basin is set at an elevation of 238.10m. According to borehole log #5 from the geotechnical report prepared by

Geospec Engineering Ltd, the elevation of the groundwater table in the vicinity of the proposed infiltration basin is 236.89m, allowing for 1.21m of separation from the bottom of the infiltration basin to the groundwater table. The maximum ponding elevations for the 5-year and 100-year storm events are 238.55m and 239.33m, respectively. The 5m wide broad crested overflow weir is set at an elevation 239.3m for safe conveyance of the Regional Storm event. This rip-rap overflow weir will convey flows generated from the Regional Storm event to the downgradient tributary of Bear Creek.

Drainage from catchment 202, which includes perimeter landscape areas and sidewalk frontages to Ardagh Road and the proposed Summerset Drive ROW, will continue to drain offsite uncontrolled like pre-development conditions. Drainage generated from the townhouse sidewalk frontages will be conveyed to the proposed storm sewer system for the new Summerset Drive ROW.

The stage-storage-discharge relationship of the proposed storage facility is summarized in Table 7.

Table 7
Stage-Storage-Discharge Relationship of Storage Cells

	Description	**Control Stage (m)**	**Elevation (m)**	**Volume (m^3)**	**Discharge (m^3/s)**
Catchment 201: Infiltration Basin	Bottom of Basin	0.00	238.10	0.00	0.0000
	Contour	0.10	238.20	213.38	0.0000
	Contour	0.20	238.30	433.50	0.0000
	Contour	0.30	238.40	660.38	0.0000
	Contour	0.40	238.50	894.00	0.0000
	Contour	0.50	238.60	1134.38	0.0000
	Contour	0.60	238.70	1381.50	0.0000
	Contour	0.70	238.80	1635.38	0.0000
	Contour	0.80	238.90	1896.00	0.0000
	Contour	0.90	239.00	2163.38	0.0000
	Contour	1.00	239.10	2437.50	0.0000
	Contour	1.10	239.20	2718.38	0.0000
	Emergency Overflow Weir	1.20	239.30	3006.00	0.0000
	Contour	1.30	239.40	3300.38	0.2806
	Contour	1.40	239.50	3601.50	0.8272
	Contour	1.50	239.60	3909.38	1.5811
	Basin Top of Berm	1.60	239.70	4224.00	2.5288

The control sizing calculations for the weir are shown in Appendix D. The location of the storm water management facility and further design details are illustrated on the conceptual engineering drawings included in Appendix E (envelope at the rear of this report).

7.1.1. Effectiveness

Table 8 and Table 9 summarize the effectiveness of the proposed stormwater attenuation feature based on the hydrologic model results.

Table 8
Model Results - 4hr Chicago and 12hr Timmins Regional Storm Distributions

	2Yr	5Yr	10Yr	25Yr	50Yr	100Yr	Timmins
Pre-Development (m^3/sec)							
Total Pre-Development	**0.007**	**0.016**	**0.024**	**0.037**	**0.047**	**0.059**	**0.102**
Post Development (m^3/sec)							
Total Post-Development	**0.506**	**0.695**	**0.833**	**1.003**	**1.141**	**1.274**	**0.430**
Post Development with SWM (m^3/sec)							
Catchment 201	0.000	0.000	0.000	0.000	0.000	0.000	0.241
Catchment 202	0.005	0.010	0.014	0.020	0.024	0.029	0.023
Total Post-Development with SWM	**0.005**	**0.010**	**0.014**	**0.020**	**0.024**	**0.029**	**0.255**

Table 9
Model Results - 24hr SCS Type II Storm Distributions

	2Yr	5Yr	10Yr	25Yr	50Yr	100Yr
Pre-Development (m^3/sec)						
Total Pre-Development	**0.016**	**0.036**	**0.052**	**0.077**	**0.097**	**0.121**
Post Development (m^3/sec)						
Total Post-Development	**0.435**	**0.640**	**0.787**	**0.981**	**1.128**	**1.276**
Post Development with SWM (m^3/sec)						
Catchment 201	0.000	0.000	0.000	0.012	0.034	0.084
Catchment 202	0.010	0.019	0.026	0.036	0.044	0.053
Total Post-Development with SWM	**0.010**	**0.019**	**0.026**	**0.036**	**0.044**	**0.089**

7.2 Quality Control

The primary objective of the stormwater management plan for this development is to maintain acceptable water quality within the receiving storm sewer network and ultimate outfall, Bear Creek, by maintaining existing site drainage patterns and flowrates. In order to provide water quality enhancement to an “enhanced” level of protection (80% TSS removal) for this development, we have incorporated a “treatment train” approach consisting of the following elements:

- Provision of "soft" landscaping where feasible.
- Yard grading using minimal surface slopes where possible to promote infiltration.
- Provision of a Stormceptor treatment unit for oil and sediment removal. The PCSWMM for Stormceptor Online Tool, by Imbrium Systems Inc., was utilized to design the appropriate treatment unit for this site. For a 3.738-hectare drainage area that is 77% impervious, a Stormceptor EF12 treatment unit (or an approved equivalent) is required. An EF12 unit will provide 82% removal of total suspended solids for drainage catchment area 201. Design calculations utilizing the manufacturer's software, and a copy of the Stormceptor EFO Owner's manual, by Imbrium Systems Inc., are included in Appendix D.
- Suitable construction mitigation measures to be utilized during the site development.

The potential treatment alternatives have been evaluated with respect to their applicability for this development and implemented in a manner to achieve the best total suspended solids (TSS) removal possible. Table 10 summarizes the proposed measures that in conglomeration will provide an overall TSS removal of greater than 80% which meets the criteria outlined.

Table 10
Proposed Approach for Water Quality Treatment

Catchment	Surface	Method	Effective TSS	Area (m²)	% Area of Site	Overall TSS Removal
201	Vegetated / Natural Areas	Filtration / Evapotranspiration	80%	12380	27.6	22.06%
	Rooftop Area	Inherent	100%	13310	29.6	29.64%
	Roads, Driveways, and Parking Areas	Stormceptor EF12 Treatment Unit	82%	15490	34.5	28.29%
202	Sidewalks and Terraces	None	0%	805	1.8	0.00%
	Vegetated / Natural Areas	Filtration / Evapotranspiration	80%	2915	6.5	5.19%
Total	Total			44900	100.0	85.18%

With the implementation of the proposed quality control plan, the proposed measures in conglomeration will provide an overall long term TSS removal of 85.18%.

7.3 Water Budget

As per the City of Barrie and NVCA SWM guidelines, sites are required to minimize any anticipated changes in the water balance between pre-development and post-development conditions and shall provide a minimum infiltration equivalent to the first 5mm of rainfall. Based on a total development area of 44,900m^2, the first 5mm of rainfall to be retained on the site for infiltration equates to 224.50m^3. Initial abstraction values provided in the City of Barrie SWM guidelines are shown in Table 11.

Table 11
Initial Abstraction Values

Cover	Initial Abstraction / Depression Storage (mm)
Woods	10
Pasture/Meadow	8
Cultivated	7
Lawns	5
Impervious Areas	2

Adapted from UNESCO, Manual on Drainage in Urbanized Areas, 1987

Using the values provided in Table 11 above, approximately 109.5m^3 of rainfall will be retained on the site through initial abstraction in the post-development condition.

Based on a review of the geotechnical report prepared for the site, and the infiltration techniques outlined in the MECP SWM Manual (2003) and the LID Manual (2010), infiltration measures are suitable for the site given the soils gravely sand condition and development-built form. The proposed infiltration basin is designed to provide an additional 2603m^3 of storage for infiltration. With the water balance benefit from the proposed infiltration basin, the site will yield an overall post-development abstraction value well over the minimum requirement of 224.50m^3. Detailed design calculations for the infiltration basin will be provided at the detailed design stage to support the Site Plan Application.

7.4 Phosphorus Budget

As part of the City of Barrie and NVCA SWM guidelines, all new developments must be accompanied with an evaluation of anticipated changes in phosphorus loadings between pre-development and post-development conditions. Visual OTTHYMO was utilized to determine pre and post development phosphorus loadings for the proposed development area. The event mean concentration (EMC) values for each land use are chosen from the LID TTT Tool, accepted by the TRCA and the LSRCA. In the pre-development condition, forest land use was assumed for phosphorus loading. For the post-development condition, the urban residential development was broken down into pavement, rooftop, and landscape land uses. The calculated phosphorus loadings are illustrated in Table 12.

Table 12
Model Results – Phosphorus Loading

	4hr Chicago		24hr SCS Type II	
	2Yr	**100Yr**	**2Yr**	**100Yr**
Pre-Development (kg)				
Total Pre-Development	**0.010**	**0.074**	**0.026**	**0.178**
Post Development (kg)				
Catchment 201	0.196	0.533	0.311	0.871
Catchment 202	0.005	0.025	0.008	0.042
Total Post-Development	**0.201**	**0.558**	**0.319**	**0.913**
Post Development with SWM (kg)				
Catchment 201	0.000	0.000	0.000	0.000
Catchment 202	0.005	0.025	0.008	0.042
Total Post-Development with SWM	**0.005**	**0.025**	**0.008**	**0.042**

The proposed infiltration basin will provide 100% TP removal, for site drainage generated from catchment 201.

A copy of the phosphorus calculations showing the proposed best management practices and their corresponding phosphorus load reductions is included in Appendix D.

8.0 EROSION AND SEDIMENT CONTROL

8.1 Mitigation Measures

Sedimentation and erosion control measures are required during construction and until such a time that all lot grading and building construction has been completed, the driveways have received their final surface treatment, and vegetation has been established in all landscape areas so that there are no open soils.

The use of various siltation control measures will be implemented to protect the adjacent properties and receiving waterbodies from migrating sediments. These works include but may not be limited to:

- Installation of siltation fencing along the perimeter of the development area, prior to earthwork operations.
- Installation of a vehicle tracking mud mat at the entrance to the site.
- Installation of silt sacks within existing and proposed storm structures to prevent

sedimentation.

Prior to carrying out site grading, the siltation barriers and mud mats shall be in place. Any onsite storm sewer works will not be permitted to outlet to Bear Creek until the site has been stabilized.

Other temporary installations of silt fence or other appropriate measures may be required during grading to minimize silt migration from the site. The measures will need to be removed, replaced and relocated as required during the construction period until the site works have been completed and vegetation established. During construction, all stockpiled material will be placed up-gradient of the siltation controls with additional siltation fencing installed around the stockpiles. Sediment and erosion control details will be provided during detailed design for the Site Plan Application.

9.0 SUMMARY AND CONCLUSIONS

The findings of this report are summarized as follows:

- The existing 525mm diameter gravity sewer within the proposed Summerset Drive ROW has the capacity to service the proposed development.
- The max day plus fire flow rate of 178.9 L/sec can be delivered to the proposed development, via a new 250mm dia. watermain, from the existing 300mm dia. watermain underneath the new Summerset Drive ROW with a residual pressure of greater than 20 psi (138 kPa).
- The subject property is within an NVCA regulated area based on available mapping on their website.
- Attenuation of peak post-development flowrates to below pre-development levels will be provided by utilizing extended detention storage within an infiltration basin.
- Quality control for the development will be provided by a treatment train approach consisting of a Stormceptor EF12 OGS unit sized to provide 82% removal of TSS for catchment 201, and an infiltration basin sized to provide 100% removal of annual total phosphorus for catchment 201.
- Suitable measures can be implemented during construction to protect the adjacent properties and receiving storm sewers from migrating sediments.

It is therefore recommended that:

1) This report and drawings be submitted to the City of Barrie and the NVCA for review and approval.

2) The construction mitigation measures outlined in this report are utilized as a guideline for construction mitigation measures for this site.

We trust this is satisfactory and should you have any questions, please call.

All of which is respectfully submitted by,

PINESTONE ENGINEERING LTD.

LICENSED PROFESSIONAL ENGINEER
J.H. VOISIN
100172758
Jan. 29th, 2021
PROVINCE OF ONTARIO

Dwight Hordyk

Dwight Hordyk, EIT
Project Designer

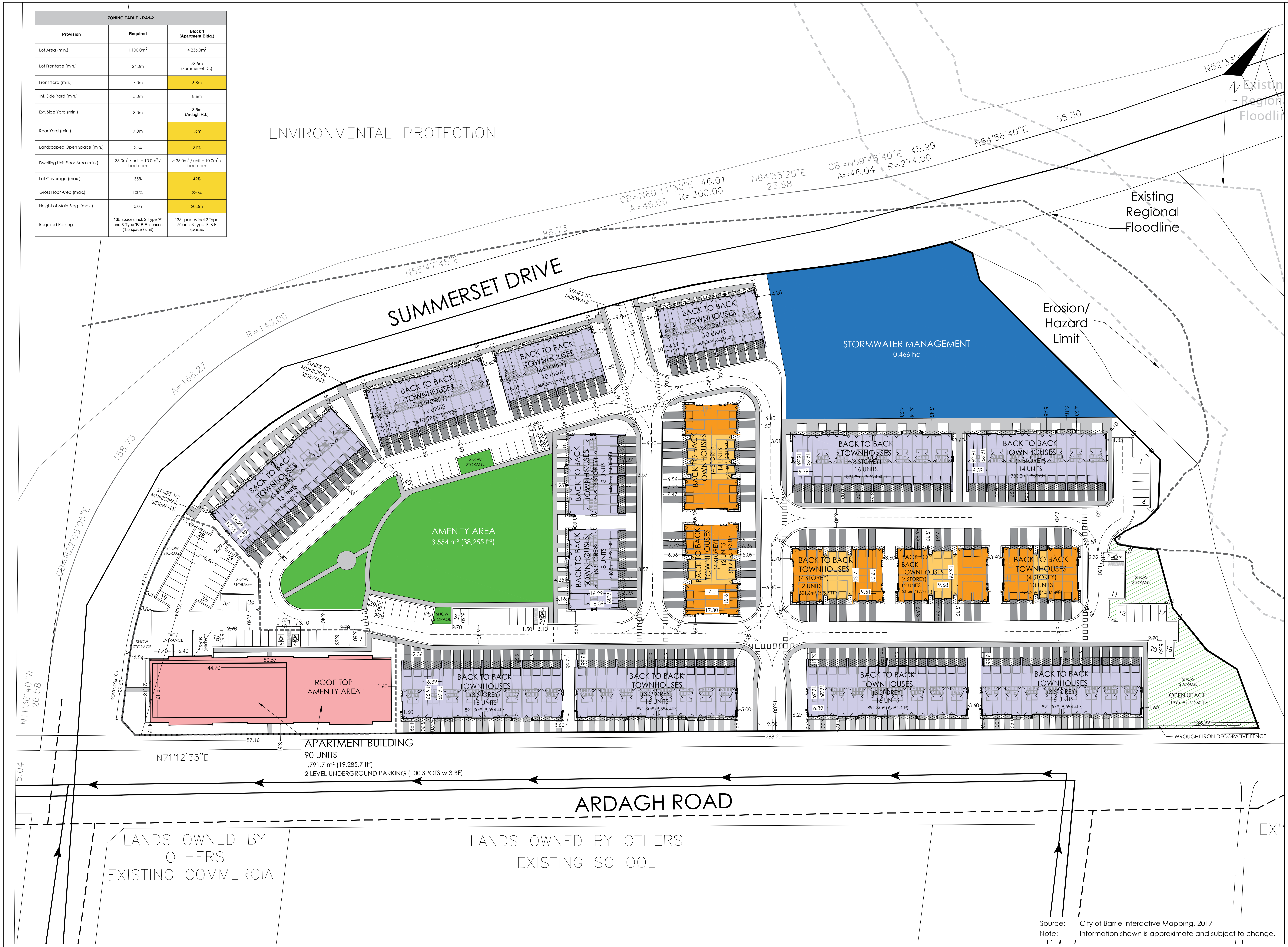
Joe Voisin, P.Eng
Senior Engineer

APPENDIX A

Proposed Site Plan Concept

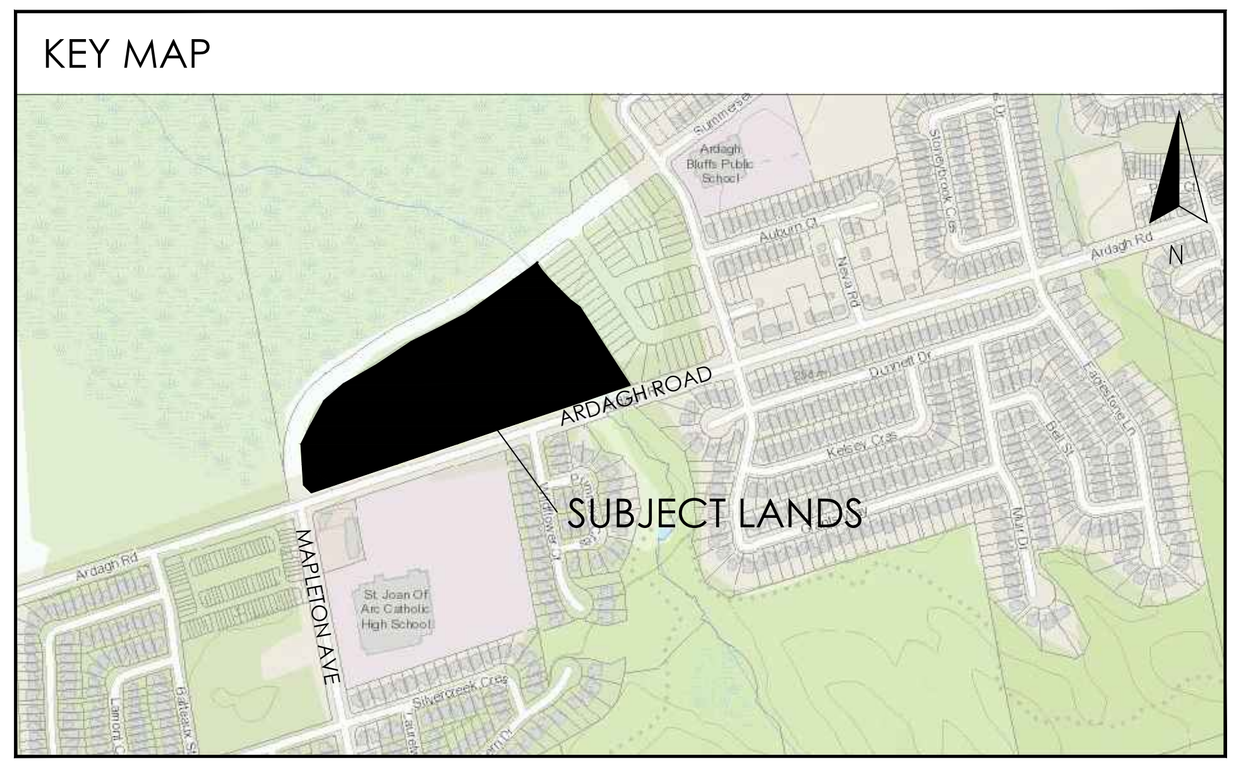
PEL
PINESTONE ENGINEERING LTD.

ZONING TABLE - RA1-2		
Provision	**Required**	**Block 1 (Apartment Bldg.)**
Lot Area (min.)	1,100.0m^2	4,236.0m^2
Lot Frontage (min.)	24.0m	73.5m (Summerset Dr.)
Front Yard (min.)	7.0m	6.8m
Int. Side Yard (min.)	5.0m	8.6m
Ext. Side Yard (min.)	3.0m	3.5m (Ardagh Rd.)
Rear Yard (min.)	7.0m	1.6m
Landscaped Open Space (min.)	35%	21%
Dwelling Unit Floor Area (min.)	35.0m^2 / unit + 10.0m^2 / bedroom	> 35.0m^2 / unit + 10.0m^2 / bedroom
Lot Coverage (max.)	35%	42%
Gross Floor Area (max.)	100%	230%
Height of Main Bldg. (max.)	15.0m	20.0m
Required Parking	135 spaces incl. 2 Type 'A' and 3 Type 'B' B.F. spaces (1.5 space / unit)	135 spaces incl 2 Type 'A' and 3 Type 'B' B.F. spaces



Source: City of Barrie Interactive Mapping, 2017
Note: Information shown is approximate and subject to change.

KEY MAP



CONCEPTUAL SITE PLAN

PART LOT 2, CONCESSION 14

IN THE
CITY OF BARRIE
COUNTY OF SIMCOE
2017

0 50m

LEGEND

▭	SUBJECT LANDS *4.49 ha (11.1 ac)*
40 UNITS	BACK-TO-BACK TOWNHOMES - TYPE 'A' (4 STOREY) *(132.6m²/ 1,427.2ft² GFA per unit)* *Rooftop Amenity Area 8.3m²/per unit*
20 UNITS	BACK-TO-BACK TOWNHOMES - TYPE 'B' (4 STOREY) *(123.6m²/ 1,330.4ft² GFA per unit)* *Rooftop Amenity Area 8.6m²/per unit*
158 UNITS	BACK-TO-BACK TOWNHOMES - TYPE 'C' (3 STOREY) *(129.0 m²/ 1,388.5 ft² GFA per unit)* *Rooftop Amenity Area 11.2m²/per unit*
90 UNITS	APARTMENT BUILDING - 6 STOREY *(1,791.7m² / 19,285.7ft^2 Building Footprint)*
🟩	AMENITY AREA
🟦	STORMWATER MANAGEMENT *0.466 ha (1.15 ac)*
▨	SIDEWALK *0.312 ha (0.77 ac)*
- - - -	WATER SERVICES
──▶──	STORM SERVICES
────	SANITARY SERVICES

AMENITY AREA
- *APARTMENT BLOCK*
  - *- ROOFTOP AMENITY AREA FOR APARTMENT BUILDING: 608.7m^2 / 6,552.4ft^2*
- *TOWNHOUSE BLOCK*
  - *- REQUIRED: 3,696m² (Consolidated)/ PROVIDED: 3,554 m² (Consolidated)*
  - *- ROOFTOP AMENITY AREA FOR BACK-TO-BACK TOWNHOMES: 2,306.9m2 / 24,830.1ft^2*

PARKING REQUIREMENTS
Apartment - 135 required/ 135 provided (5 BF; 2 TYPE 'A' & 3 TYPE 'B')
Townhomes - 327 required/ 488 provided (3 BF; 1 TYPE 'A' & 2 TYPE 'B')

ZONING TABLE - RM2 - SP		
Provision	**Required**	**Block 2 (Back-to-Back TH)**
Lot Area (min.)	720.0m^2	40,696.0m^2
Lot Frontage (min.)	21.0m	288.2m (Ardagh Rd.)
Front Yard (min.)	7.0m	3.8m
Int. Side Yard (min.)	1.8m	1.6m
Ext. Side Yard (min.)	3.0m	5.0m (Summerset Dr.)
Rear Yard (min.)	7.0m	N.A.
Landscaped Open Space (min.)	35%	43%
Dwelling Unit Floor Area (min.)	35.0m^2 / unit + 10.0m^2 / bedroom	> 35.0m^2 / unit + 10.0m^2 / bedroom
Lot Coverage (max.)	35%	33%
Gross Floor Area (max.)	60%	70%
Height of Main Bldg. (max.)	10.0m	15.0m
Amenity Area (min.)	2,616.0m^2 (consolidated)	3,554.0m^2 (consolidated) + min. 8.3m^2 rooftop amenity / unit
Required Parking	327 spaces incl. 5 Type 'A' and 6 Type 'B' B.F. spaces (1.5 space / unit)	218 / unit + 52 Visitor incl. 1 Type 'A' and 2 Type 'B' (1.23 spaces / unit) + 218 garage spaces
Permitted Uses	Section 5.2.1 Table 5.2	Back-to-Back T.H.
Density	53 units / ha	55 units / ha

CONCEPTUAL SITE PLAN - 308 UNITS

BEAR CREEK VILLAGE

RESIDENTIAL	CURRENT OP DESIGNATION
RM2	CURRENT ZONE

SCHEDULE OF REVISIONS			
No.	Date	Description	By
1	Dec. 17, 2020	Adjust max. height of buildings;	A.S.
5	Jan. 18, 2021	Create 2 separate blocks	A.S.

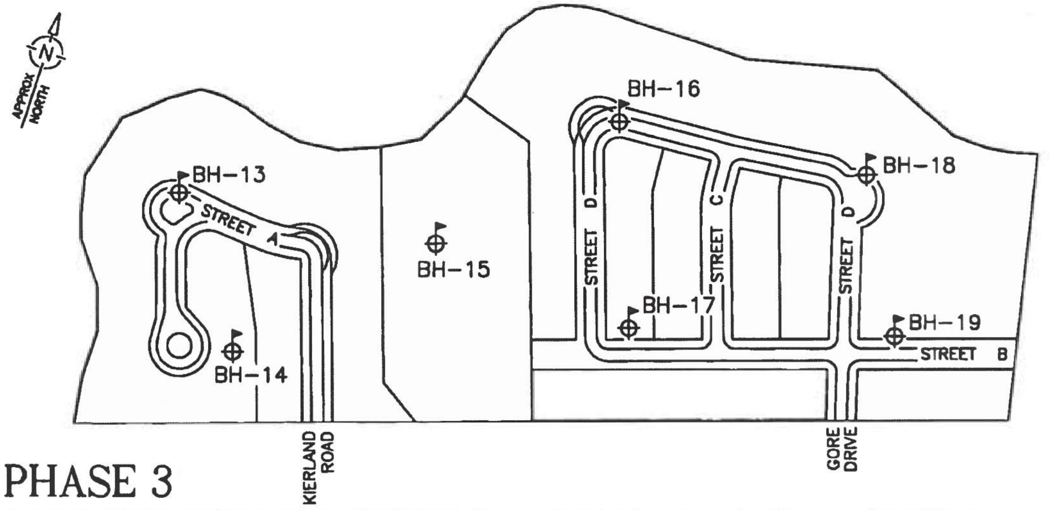
IPS
INNOVATIVE PLANNING SOLUTIONS
PLANNERS • PROJECT MANAGERS • LAND DEVELOPERS
647 WELHAM RD., UNIT 9, BARRIE, ONTARIO L4N 0B7
tel: 705 • 812 • 3281 fax: 705 • 812 • 3434 e: info@ipsconsultinginc.com www.ipsconsultinginc.com

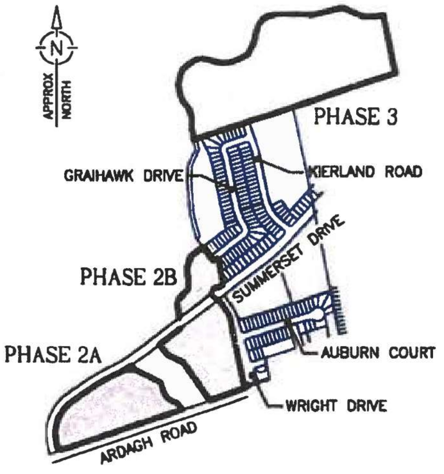
Date: November 21, 2019	Drawn By: A.S.
File: 17-732	Checked: G.B.

APPENDIX B

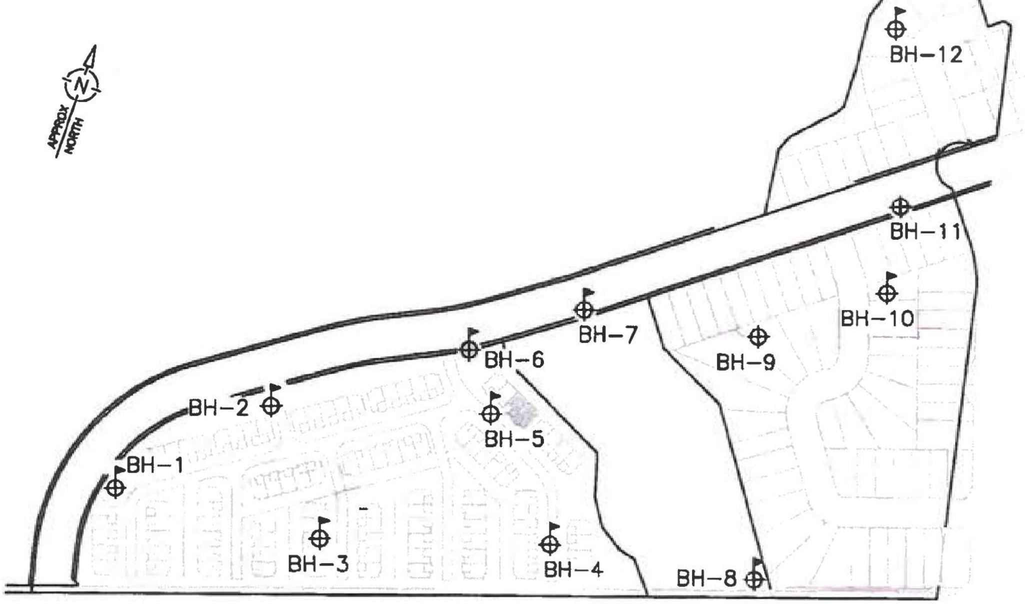
Geotechnical Investigation

PHASE 3





PHASE 2A & 2B



NOTES:
-ALL BOREHOLE LOCATIONS WERE PROVIDED AND LOCATED BY EXP.
-ALL SURVEY INFORMATION, INCLUDING BOREHOLE LOCATIONS AND ELEVATIONS, HAS BEEN INFERRED FROM DIGITAL FILES (.dwg AND .pdf RESPECTIVELY) PROVIDED BY EXP ON MARCH 30, 2012.

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ENGINEERING LTD.
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Barrie, Ontario, L4N 7R8
TEL: (705) 722-4638
FAX: (705) 722-4958

PROJECT NAME
Meadows of Bear Creek
Phases 2A, 2B & 3

CLIENT
Auburn Developments Inc.
Graihawk Estates Inc.

PROJECT NUMBER	ENCLOSURE
12 - 1696	1

TITLE
BOREHOLE PLAN

LEGEND
⊕ **BOREHOLE**
STANDPIPE

BOREHOLE ELEVATIONS (m)

1	238.20	11	239.06
2	239.83	12	236.36
3	241.17	13	234.53
4	241.97	14	234.69
5	238.99	15	234.69
6	237.69	16	234.70
7	238.18	17	234.98
8	243.16	18	234.77
9	239.83	19	234.98
10	240.36		

SCALE
Not to Scale

DATE
April 3 / 2012

DRAWN	CHECKED
F.G.	K.M.

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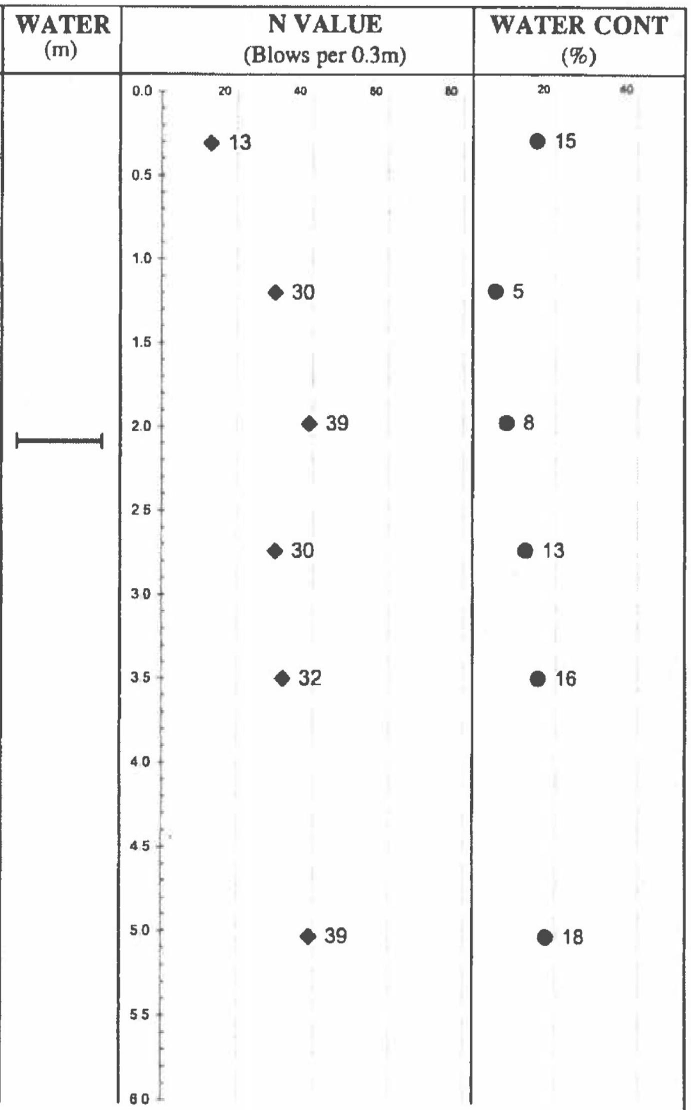
BOREHOLE LOG

CLIENT: Auburn Developments Inc., Graihawk Estates Inc.
DATE: April 02, 2012
PROJECT N°: 12 - 1696
PROJECT: Meadows of Bear Creek, Phase 2A
BOREHOLE N°: 1
ENCLOSURE N°: 2
GROUND ELEVATION: 238.20 m
BORING DATE: February 27, 2012
PAGE 1 **OF** 1
BORING METHOD: Solid Stem Auger
SAMPLING METHOD: Split Spoon

ELEV (m)	**SOIL DESCRIPTION** (Unified Soil Classification System)
	± 40cm of **Organically included** material
237.8	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Moist to Saturated, Dense
	Gradation @ 5.0m ¬ Sand 92%, Silt 6%, Gravel 2%
233.0	END OF BH
	Wet & caved in to 2.4m upon completion. 19mm PVC standpipe installed to 4.6m Standpipe vandalized by the time of measurement.



◆ Standard Penetration Test ▲ Cone Penetration Test

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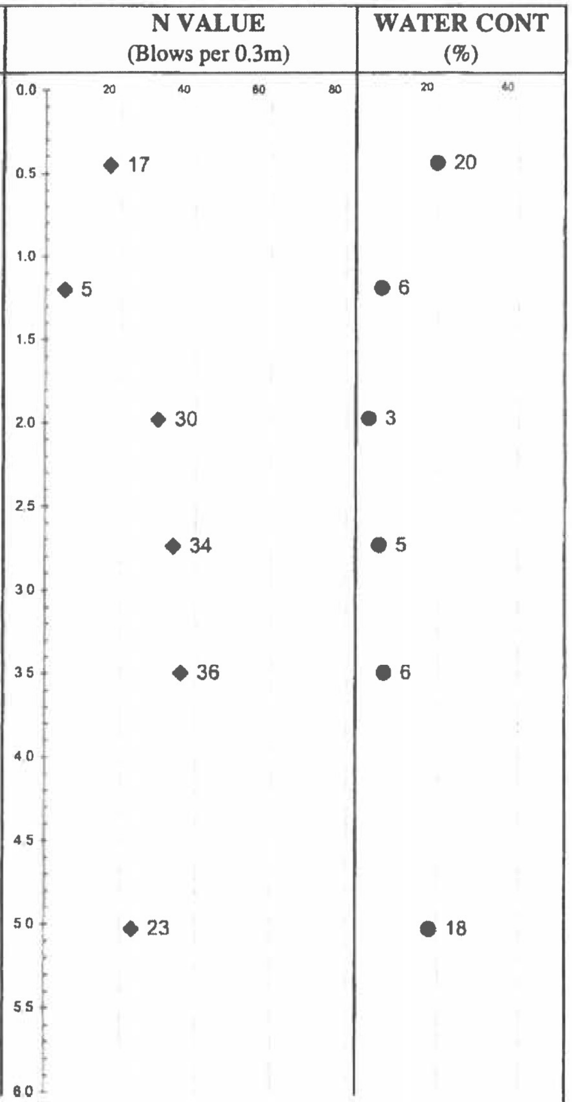
BOREHOLE LOG

CLIENT: Auburn Developments Inc., Graihawk Estates Inc.
DATE: April 02, 2012
PROJECT N°: 12 - 1696
PROJECT: Meadows of Bear Creek, Phase 2A
BOREHOLE N°: 2
ENCLOSURE N°: 3
GROUND ELEVATION: 239.83 m
BORING DATE: February 27, 2012
BORING METHOD: Solid Stem Auger
SAMPLING METHOD: Split Spoon
PAGE 1 **OF** 1

ELEV (m)	SOIL DESCRIPTION (Unified Soil Classification System)	WATER (m)
	± 40cm of **Organically included** material	
239.4	**SAND** with trace Silt & Gravel Brown, Moist, Loose	
238.3	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Moist to Saturated, Dense	
234.6	END OF BH Dry & caved in to 4.8m upon completion. 19mm PVC standpipe installed to 3.4m Water level at 3.5m measured on March 22, 2012	



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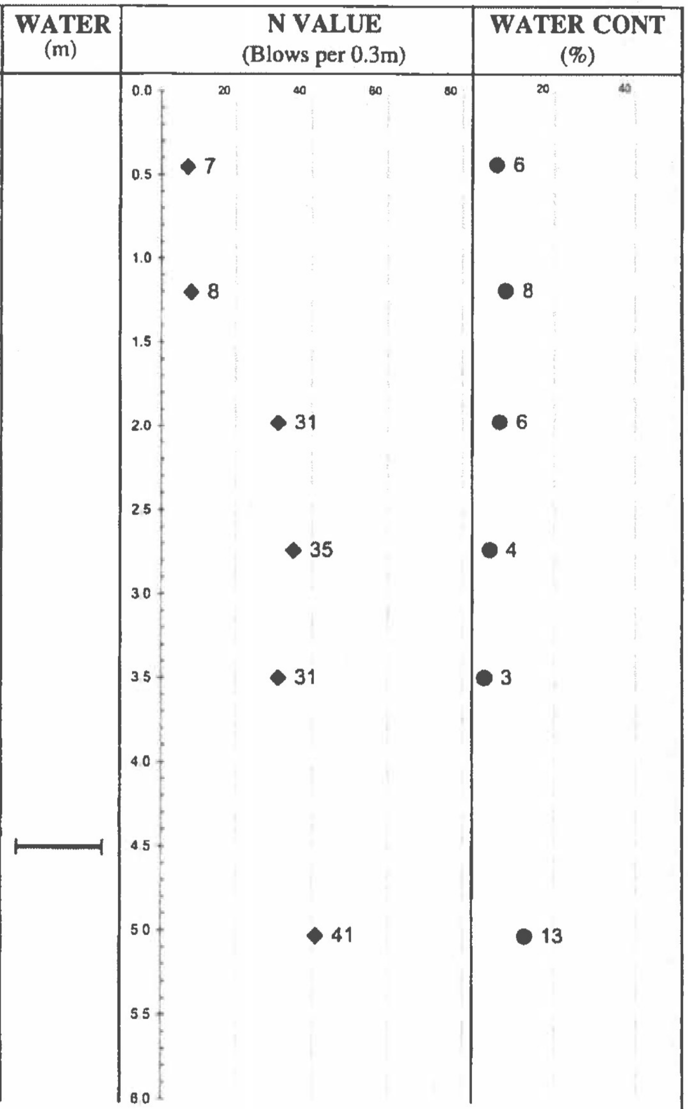
BOREHOLE LOG

CLIENT:	Auburn Developments Inc., Graihawk Estates Inc.	**DATE:**	April 02, 2012
		PROJECT N°:	12 - 1696
PROJECT:	Meadows of Bear Creek, Phase 2A	**BOREHOLE N°:**	3
		ENCLOSURE N°:	4
GROUND ELEVATION:	241.17 m	**BORING METHOD:**	Solid Stem Auger
BORING DATE:	February 27, 2012	**SAMPLING METHOD:**	Split Spoon
PAGE 1 **OF** 1			

ELEV (m)	SOIL DESCRIPTION (Unified Soil Classification System)
	± 50cm of **TOPSOIL** *to* **Organically included material**
240.7	**SAND** with trace Silt & Gravel Brown, Moist, Loose
239.9	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Moist to Saturated, Dense Gradation @ 2.0m ¬ Sand 49%, Gravel 33%, Silt 18%
236.0	END OF BH Dry & caved in to 4.3m upon completion. 19mm PVC standpipe installed to 4.6m Water level at 4.5m measured on March 22, 2012



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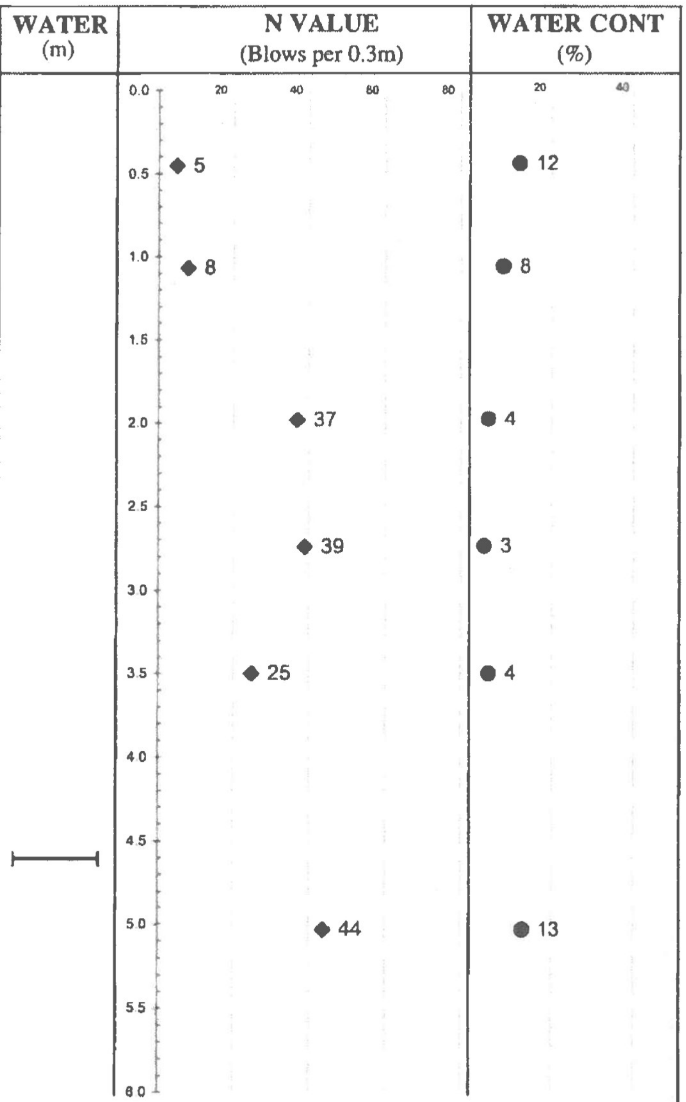
BOREHOLE LOG

CLIENT: Auburn Developments Inc., Graihawk Estates Inc.
DATE: April 02, 2012
PROJECT N°: 12 - 1696
PROJECT: Meadows of Bear Creek, Phase 2A
BOREHOLE N°: 4
ENCLOSURE N°: 5
GROUND ELEVATION: 241.97 m
BORING DATE: February 27, 2012
PAGE 1 **OF** 1
BORING METHOD: Solid Stem Auger
SAMPLING METHOD: Split Spoon

ELEV (m)	SOIL DESCRIPTION (Unified Soil Classification System)
	± 50cm of **TOPSOIL** *to* **Organically included** material
241.5	**SAND** with trace Silt & Gravel Brown, Moist, Loose
240.8	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Moist to Saturated, Dense
236.8	END OF BH Dry & caved in to 3.7m upon completion. 19mm PVC standpipe installed to 4.7m Water level at 4.6m measured on March 22, 2012



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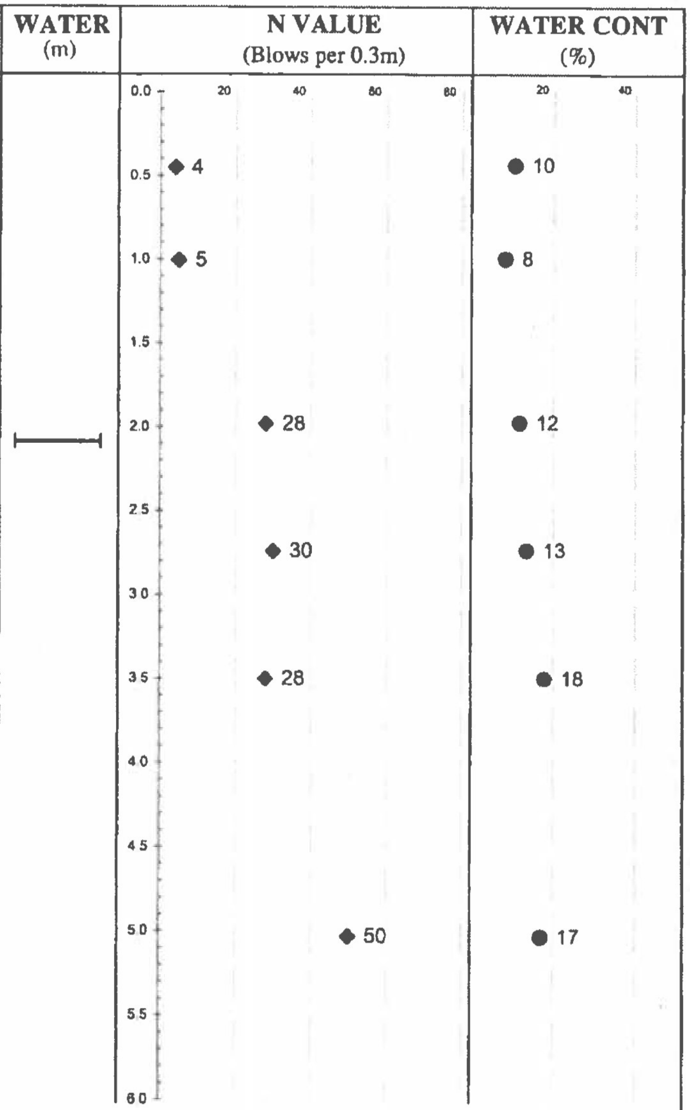
TEL: (705) 722-4638 FAX: (705) 722-4958

BOREHOLE LOG

CLIENT:	Auburn Developments Inc., Graihawk Estates Inc.	**DATE:**	April 02, 2012
		PROJECT N°:	12 - 1696
PROJECT:	Meadows of Bear Creek, Phase 2A	**BOREHOLE N°:**	5
		ENCLOSURE N°:	6
GROUND ELEVATION:	238.99 m	**BORING METHOD:**	Solid Stem Auger
BORING DATE:	February 27, 2012	**SAMPLING METHOD:**	Split Spoon
PAGE 1 **OF** 1			

ELEV (m)	**SOIL DESCRIPTION** (Unified Soil Classification System)
	± 30cm of **TOPSOIL** *to* **Organically included material**
238.7	**SAND** with trace Silt & Gravel Brown, Moist, Loose Gradation @ 1.2m ¬ Sand 90%, Silt 9%, Gravel 1%
237.9	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Moist to Saturated, Dense
233.8	END OF BH Wet & caved in to 2.1m upon completion. 19mm PVC standpipe installed to 4.3m Water level at 2.1m measured on March 22, 2012



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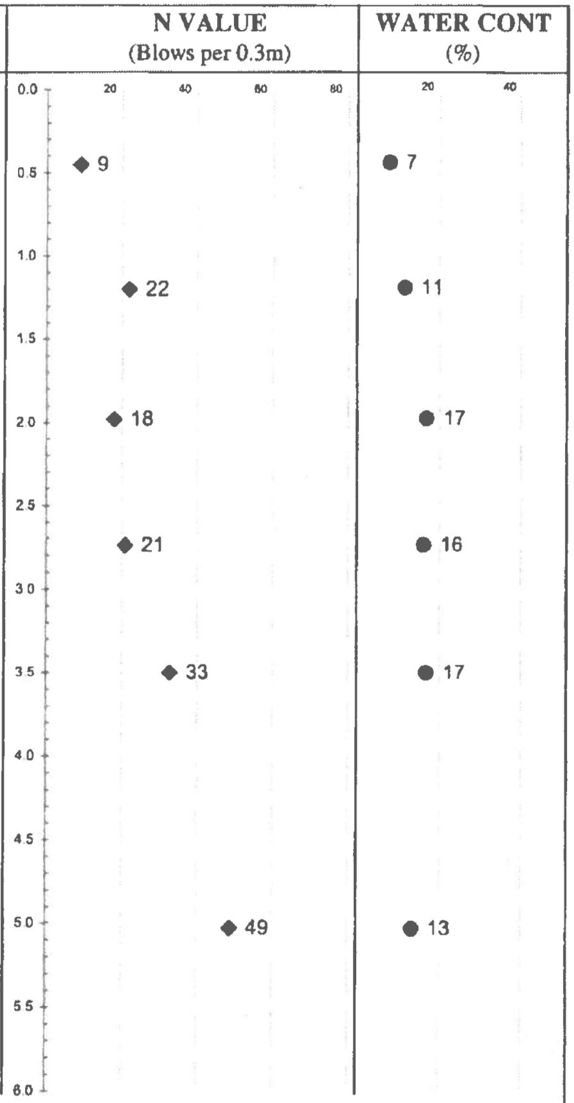
BOREHOLE LOG

CLIENT:	Auburn Developments Inc., Graihawk Estates Inc.	**DATE:**	April 02, 2012
		PROJECT N°:	12 - 1696
PROJECT:	Meadows of Bear Creek, Phase 2A	**BOREHOLE N°:**	6
		ENCLOSURE N°:	7
GROUND ELEVATION:	237.69 m	**BORING METHOD:**	Solid Stem Auger
BORING DATE:	February 27, 2012	**SAMPLING METHOD:**	Split Spoon
PAGE 1 **OF** 1			

ELEV (m)	**SOIL DESCRIPTION** (Unified Soil Classification System)	**WATER** (m)
	± 50cm of **TOPSOIL** *to* **Organically included** material	
237.2	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Wet to Saturated, Compact to Dense Gradation @ 2.0m ¬ Sand 82%, Silt 9%, Gravel 9%	
232.5	END OF BH Dry & caved in to 1.5m upon completion. 19mm PVC standpipe installed to 4.1m Water level at 1.1m measured on March 22, 2012	



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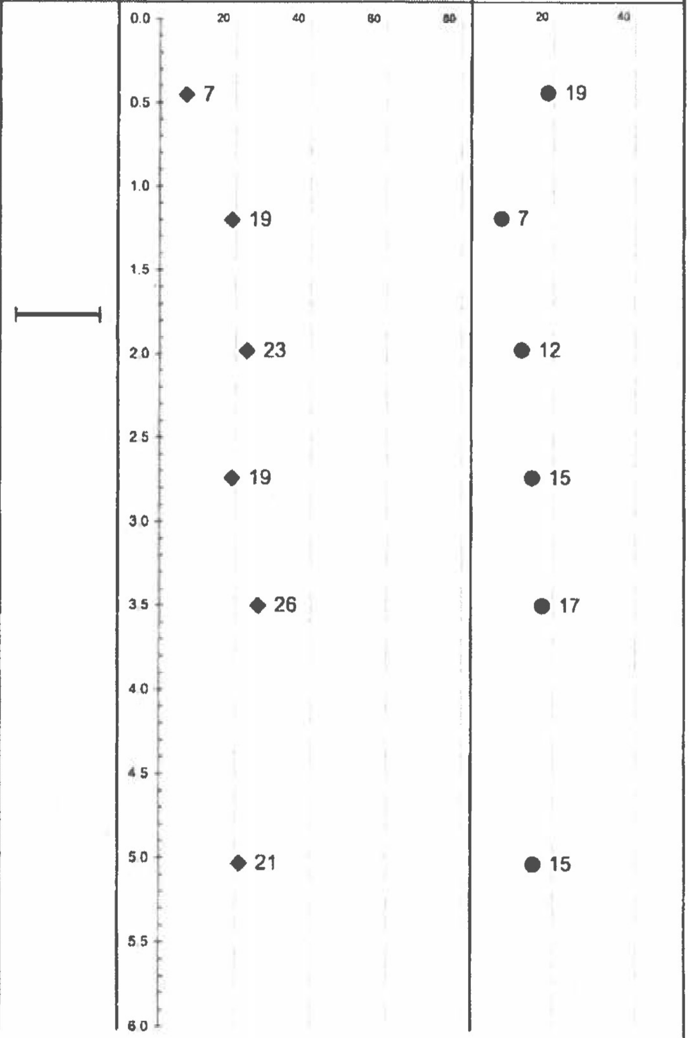
BOREHOLE LOG

CLIENT:	Auburn Developments Inc., Graihawk Estates Inc.	**DATE:**	April 02, 2012
		PROJECT N°:	12 - 1696
PROJECT:	Meadows of Bear Creek, Phase 2B	**BOREHOLE N°:**	7
		ENCLOSURE N°:	8
GROUND ELEVATION:	238.18 m	**BORING METHOD:**	Solid Stem Auger
BORING DATE:	February 27, 2012	**SAMPLING METHOD:**	Split Spoon
PAGE 1 **OF** 1			

ELEV (m)	**SOIL DESCRIPTION** (Unified Soil Classification System)	**WATER** (m)	**N VALUE** (Blows per 0.3m)	**WATER CONT** (%)
	± 100cm of **TOPSOIL** *to* **Organically included** material			
237.2	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Moist to Saturated, Compact			
233.0	END OF BH Wet & caved in to 0.9m upon completion. 19mm PVC standpipe installed to 4.1m Standpipe vandalized by the time of measurement.			



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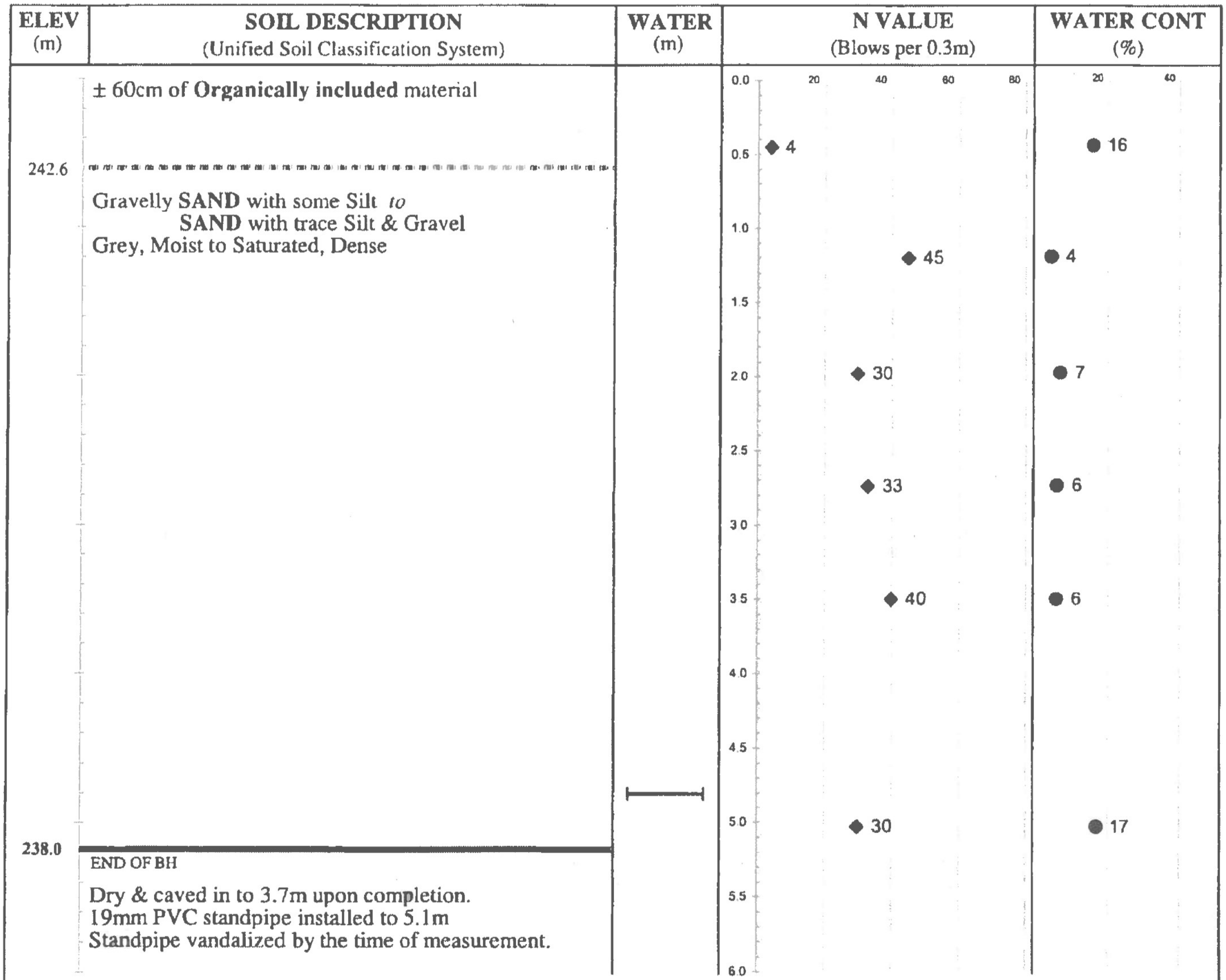
BOREHOLE LOG

CLIENT: Auburn Developments Inc., Graihawk Estates Inc.
DATE: April 02, 2012
PROJECT N°: 12 - 1696
PROJECT: Meadows of Bear Creek, Phase 2B
BOREHOLE N°: 8
ENCLOSURE N°: 9
GROUND ELEVATION: 243.16 m
BORING METHOD: Solid Stem Auger
BORING DATE: February 27, 2012
SAMPLING METHOD: Split Spoon
PAGE 1 **OF** 1



± 60cm of **Organically included** material

Gravelly **SAND** with some Silt *to*
SAND with trace Silt & Gravel
Grey, Moist to Saturated, Dense

END OF BH

Dry & caved in to 3.7m upon completion.
19mm PVC standpipe installed to 5.1m
Standpipe vandalized by the time of measurement.

◆ Standard Penetration Test ▲ Cone Penetration Test

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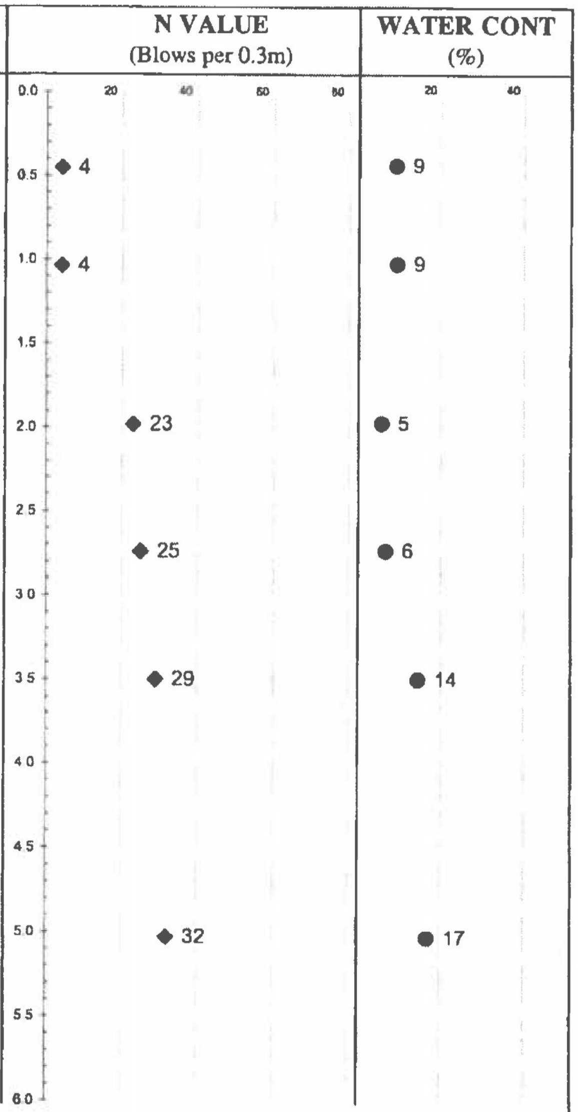
BOREHOLE LOG

CLIENT: Auburn Developments Inc., Graihawk Estates Inc.
DATE: April 02, 2012
PROJECT N°: 12 - 1696
PROJECT: Meadows of Bear Creek, Phase 2B
BOREHOLE N°: 9
ENCLOSURE N°: 10
GROUND ELEVATION: 239.83 m
BORING DATE: February 27, 2012
PAGE 1 **OF** 1
BORING METHOD: Solid Stem Auger
SAMPLING METHOD: Split Spoon

ELEV (m)	**SOIL DESCRIPTION** (Unified Soil Classification System)	**WATER** (m)
	± 45cm of **Organically included** material	
239.4	**SAND** with trace Silt & Gravel Brown, Moist, Loose	
238.7	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Moist to Saturated, Compact to Dense	
234.6	END OF BH Dry & caved in to 3.0m upon completion. No 19mm PVC standpipe installed.	



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07/09

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BOREHOLE LOG

CLIENT: Auburn Developments Inc., Graihawk Estates Inc.
DATE: April 02, 2012
PROJECT N°: 12 - 1696
PROJECT: Meadows of Bear Creek, Phase 2B
BOREHOLE N°: 10
ENCLOSURE N°: 11
GROUND ELEVATION: 240.36 m
BORING DATE: February 24, 2012
BORING METHOD: Solid Stem Auger
SAMPLING METHOD: Split Spoon
PAGE 1 **OF** 1

ELEV (m)	SOIL DESCRIPTION (Unified Soil Classification System)	WATER (m)	N VALUE (Blows per 0.3m)	WATER CONT (%)
	± 45cm of **Organically included** material			
239.9	**SAND** with trace Silt & Gravel Brown, Moist, Loose		◆ 7	● 13
239.3	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Moist to Saturated, Compact to Dense		◆ 9	● 9
			◆ 28	● 6
	Gradation @ 2.7m ¬ Sand 59%, Gravel 30%, Silt 11%		◆ 35	● 4
			◆ 31	● 5
		├─┤		
			◆ 47	● 18
235.2	END OF BH Dry & caved in to 3.7m upon completion. 19mm PVC standpipe installed to 4.4m Water level at 3.7m measured on March 22, 2012			

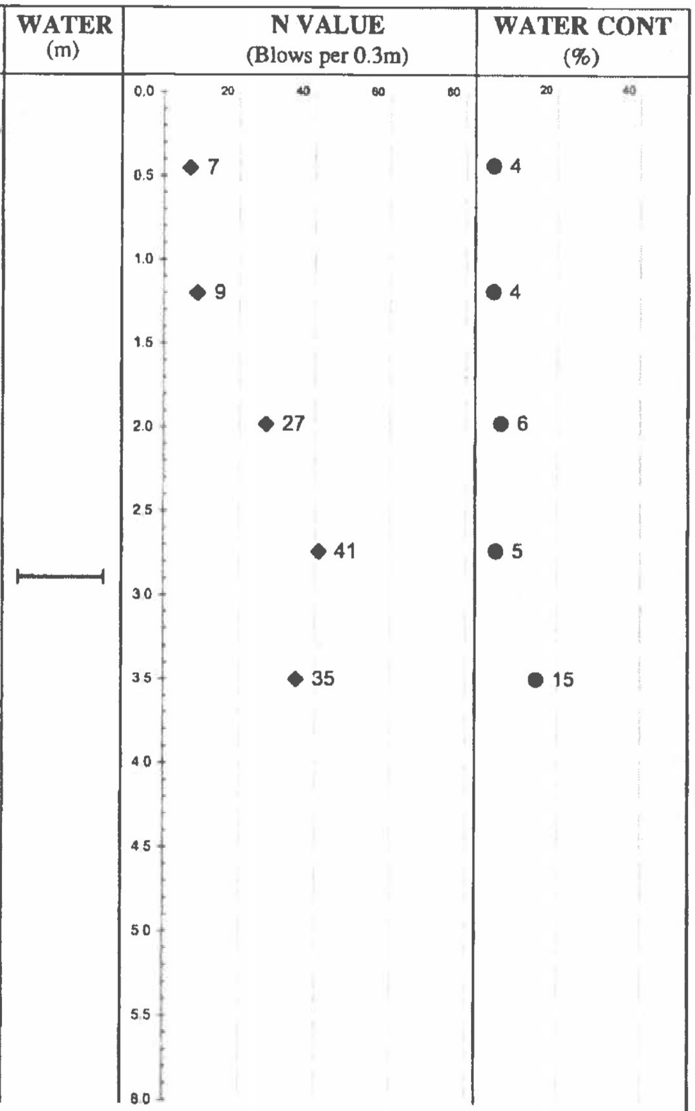
◆ Standard Penetration Test ▲ Cone Penetration Test

GEOSPEC ENGINEERING LTD.
287 Tiffin Street, Unit 10, Barrie, Ontario L4N 7R8
TEL: (705) 722-4638 FAX: (705) 722-4958

BOREHOLE LOG

CLIENT: Auburn Developments Inc., Graihawk Estates Inc.
DATE: April 02, 2012
PROJECT N°: 12 - 1696
PROJECT: Meadows of Bear Creek, Phase 2B
BOREHOLE N°: 11
ENCLOSURE N°: 12
GROUND ELEVATION: 239.06 m
BORING METHOD: Solid Stem Auger
BORING DATE: February 27, 2012
SAMPLING METHOD: Split Spoon
PAGE 1 **OF** 1

ELEV (m)	SOIL DESCRIPTION (Unified Soil Classification System)
	± 25cm of **Organically included material**
238.8	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Moist to Saturated, Compact to Dense Gradation @ 1.2m ¬ Sand 89%, Silt 11%
235.4	END OF BH Dry & caved in to 2.1m upon completion. No 19mm PVC standpipe installed.



◆ Standard Penetration Test ▲ Cone Penetration Test

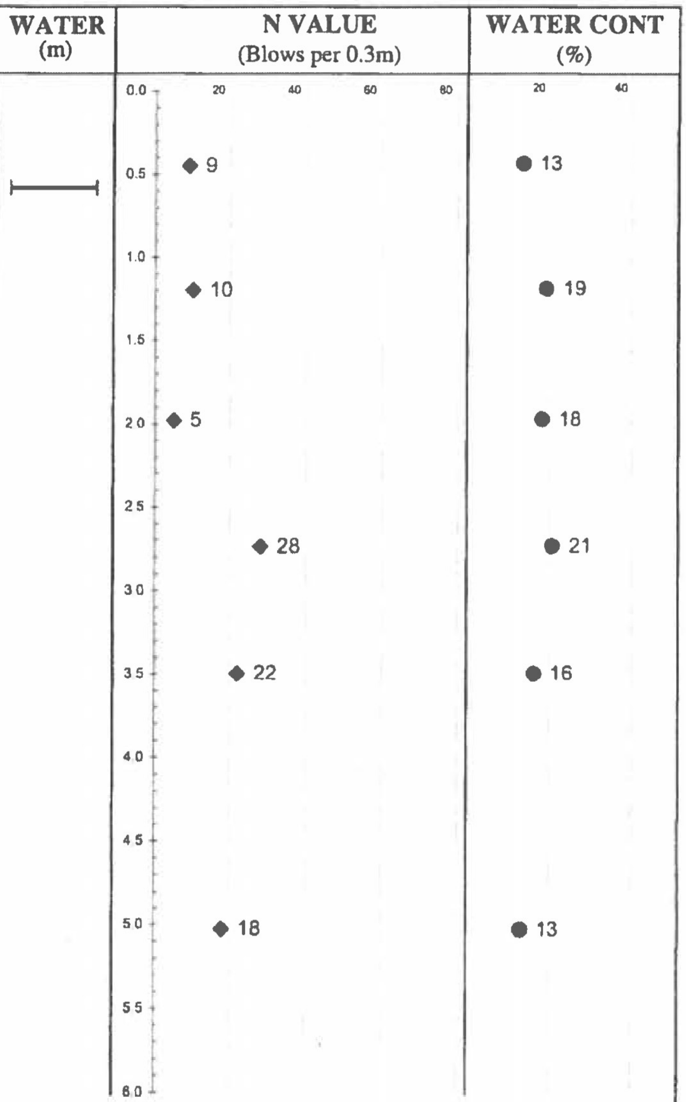
07/09

GEOSPEC ENGINEERING LTD.
287 Tiffin Street, Unit 10, Barrie, Ontario L4N 7R8
TEL: (705) 722-4638 FAX: (705) 722-4958

BOREHOLE LOG

CLIENT: Auburn Developments Inc., Graihawk Estates Inc.
DATE: April 02, 2012
PROJECT N°: 12 - 1696
PROJECT: Meadows of Bear Creek, Phase 2B
BOREHOLE N°: 12
ENCLOSURE N°: 13
GROUND ELEVATION: 236.36 m
BORING METHOD: Solid Stem Auger
BORING DATE: February 24, 2012
SAMPLING METHOD: Split Spoon
PAGE 1 **OF** 1

ELEV (m)	SOIL DESCRIPTION (Unified Soil Classification System)
	(No Topsoil / Organically included material) Sandy **SILT FILL** with some Gravel Brownish, Moist to Wet, Loose
234.9	Gravelly **SAND** with some Silt *to* **SAND** with trace Silt & Gravel Grey, Saturated, Loose to Compact
231.2	END OF BH Wet & caved in to 2.1m upon completion. 19mm PVC standpipe installed to 2.0m Water level at 0.6m measured on March 22, 2012



◆ Standard Penetration Test ▲ Cone Penetration Test

07/09

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL (416) 754-8515 · FAX (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

October 11, 2017

Reference No. 1710-C035

1862145 Ontario Inc.
190 Pippin Road
Concord, ON L4K 4X9

Attention: Reeja Bhattarai

Re: Preliminary Test Pit Investigation for
Land Purchase Agreement
Bear Creek Lands – Phase 2B
City of Barrie

Dear Sir,

We visited the site on October 6, 2017 to inspect seven (7) test pits in order to facilitate a geotechnical assessment of the subsurface conditions, during a diligence period of a proposed land purchase agreement. The test pit locations, labeled TP1 through TP7 are plotted on Drawing No.1, enclosed.

Seven (7) test pits were excavated by a rubber-tire excavator to depths ranging from approximately 1.8 to 2.7 m below the prevailing ground surface. A summary of the subsurface findings is presented below:

Table 1 – Summary of Subsurface Findings

TP1	TP2	TP3	TP4	TP5	TP6	TP7
Topsoil 0.1 m	Topsoil 0.1 m	Topsoil 0.2 m	Topsoil 0.5 m	Topsoil 0.2 m	Topsoil 0.1 m	Topsoil 0.1 m
Sand/gravel 0.3 m	Sand/gravel 0.3 m	Sand/gravel 0.3 m	Sand to termination @ 2.6 m	Sand/gravel to termination @ 1.8 m	Sand to termination @ 2.7 m	Sand to termination @ 2.3 m
Sand to termination @ 2.6 m	Sand to termination @ 2.5 m	Sand to termination @ 2.5 m				

All test pits extended through an overburden of topsoil and weathered soils, terminating into the native stratum of compact brown sand capable of sustaining a Maximum Allowable Soil Pressure of 150 kPa. Moderate seepage was observed at a depth 1.6 m (TP4 & TP5) and 2.3 m (TP7), all other test pits remained dry upon completion.

Please be aware that the scope of this preliminary investigation is limited in nature and a full geotechnical investigation should be completed in order to facilitate the design & construction of the proposed development.

This report was prepared by Soil Engineers Ltd for the account of Mr. Reeja Bhattarai_of 1862145 Ontario Inc. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

We trust this letter is explicit and meets your present needs, however; should any queries arise please feel free to contact this office.

Yours very truly,
SOIL ENGINEERS LTD.

Darcy Heitzner, Geo.Tech.
Branch Manager
Encl.
DH:

Drawing No. 1
Bear Creek Lands – Phase 2B
Reference No. 1710-C035
October 11, 2017

Design Chart 1.08: Hydrologic Soil Groups (Continued)

- Based on Soil Texture

Sands, Sandy Loams and Gravels	
- overlying sand, gravel or limestone bedrock, very well drained	A
- ditto, imperfectly drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium to Coarse Loams	
- overlying sand, gravel or limestone, well drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium Textured Loams	
- shallow, overlying limestone bedrock	B
- overlying medium textured subsoil	BC
Silt Loams, Some Loams	
- with good internal drainage	BC
- with slow internal drainage and good external drainage	C
Clays, Clay Loams, Silty Clay Loams	
- with good internal drainage	C
- with imperfect or poor external drainage	C
- with slow internal drainage and good external drainage	D

Source: U.S. Department of Agriculture (1972)

APPENDIX C

Water and Sanitary Servicing Calculations

3.2.4. Septic Systems

Development of private sewage treatment systems is not permitted. The review and approval of new private sewage treatment systems may be considered by the City only in cases where replacement or upgrading of existing systems is warranted.

3.2.5. Standard Drawings

In addition to these written guidelines, reference should also be made to the standard engineering drawings included in the City of Barrie Design Standards (BSDs).

3.3. <u>Design Flows</u>

The careful determination of design flows is a crucial step in the design of an appropriate sanitary sewage collection system. The design flows for sanitary sewer design must account for flows from all sources: residential connections, commercial and institutional connections, industrial connections and extraneous flows from groundwater infiltration and surface water inflow.

In lieu of precise information on development on the whole or any part of the sanitary sewer drainage area, reference will be made to the latest zoning plan issued by the Planning Services Department.

3.3.1. Residential Flows

3.3.1.1. Design Population

<u>Land Use or Zoning Designation Basis</u>

When the most detailed knowledge of the ultimate land use for the tributary area consists simply of its overall proposed land use and/or zoning as determined from such sources as the governing Official Plan, Secondary Plans or Zoning By-Law, the design population can be estimated on an area basis using the following minimum design population values. When the exact land use/zoning is not confidently known, then an assessment shall be made and more restrictive values must be used. The City may alter the values associated with any particular development as determined appropriate.

Low Density	single detached, duplexes or semi-detached dwellings	25 units/hectare @ 3.13 ppu

- Typical zoning designations for Low Density Development may include RH, R1, R2, R3, R4, RM1 and RM1-SS. It should be noted that zoning designations are subject to change, and it is the responsibility of the designer to ensure that the most current zoning by-laws and designations are being used.

Medium Density	triplexes and fourplexes	26 - 35 units/hectare @ 2.34 ppu
	cluster and/or block townhouses	40 units/hectare @ 2.34 ppu
	street townhouses	47 units/hectare @ 2.34 ppu
	‘walk-up’ apartments	26 - 53 units/hectare @ 2.34 ppu

- Typical zoning designations for Medium Density Development may include RM2 and RM2-TH. It should be noted that zoning designations are subject to change and it is the responsibility of the designer to ensure that the most current zoning by-laws and designations are being used.

High Density	Apartment dwellings	54 - 300 units/hectare @ 1.67ppu

- Typical zoning designations for High Density Development may include RA1 and RA2. It should be noted that zoning designations are subject to change, and it is the responsibility of the designer to ensure that the most current zoning by-laws and designations are being used.

The method of determining design population for residential flows will depend upon the particular stage that is being considered and the appropriate detail required for the desired level of design accuracy. Reference shall be made to current zoning policies.

Development Details Basis

When the details regarding the proposed uses on individual lots are known, or can be assumed with reasonable certainty, a more detailed approach to design population and associated design flow estimation is required. This approach involves the determination of individual design flows for the various areas in the tributary area which will contribute to an individual sewer reach. The actual number of units shall be used and the design population estimated using the following people per unit (ppu) values.

Low Density	3.13 ppu
Medium Density	2.34 ppu
High Density	1.67 ppu

3.3.1.2. Average Daily Flow

Average daily domestic flow = 225 L/day/person (excluding extraneous flows)

3.3.1.3. Peak Flow

Peak domestic flow is to be calculated using the following formula:

$$\mathrm{Qp} = \frac{\mathrm{P \times q \times M}}{86.4} + \mathrm{I \times A}$$

Where Qp = Peak residential sanitary sewage flow, including peak extraneous flows (L/s)

P = Design population in thousands (see Section 3.3.1.1)

q = Average daily domestic flow per capita (L/day/person) (see Section 3.3.1.2)

M = Peaking factor (see Section 3.3.1.3)

I = Peak extraneous flow (L/s/ha) (see Section 3.3.4)

A = Tributary area (ha) (see Section 3.2.2)

As per the MOECC Design Guidelines for Sewage Works, 2008 (MOE Guidelines), the peaking factor, M, can be calculated using the Harmon Formula or Babbit Formula. The Babbit Formula gives peaking factors that are more representative of instantaneous peaks, and the Harmon Formula gives peaking factors that are more representative of peak hour. The Babbit Formula shall only be used to assess the upstream reaches of the sewer shed where depth of flow and minimum scour is a concern for partial flow conditions where depth of flow is less than 30% of the pipe diameter.

Harmon Formula

$$\mathrm{M} = 1 + \frac{14}{4 + \mathrm{P}^{0.5}}$$

3.3.4. Extraneous Flows

When designing a sanitary sewer system, an allowance should be made for the infiltration of groundwater into the sewers and sanitary service connections (infiltration) and for other extraneous water entering the sewers from sources such as maintenance hole covers (inflow).

The amount of groundwater leakage into the sewer system will vary with the quality of construction, type of joints, ground conditions, and level of groundwater in relation to pipe. Although such infiltration can be reduced by proper design, construction, and maintenance, it cannot be completely eliminated and an allowance should be made in the design sewage flows to incorporate this flow component.

An extraneous flow rate of 0.1 L/s/ha shall be used for sanitary sewer design.

The above rate assumes strict adherence to construction standards in the installation of sanitary sewers and building connections, and does not account for any other extraneous flows such as foundation drain connections, excessive flooding through maintenance hole covers, significant groundwater problems, etc.

Where collection system infrastructure is being designed to convey flows from existing developed areas, the extraneous flow allowance used may be increased based on flow monitoring data and/or system modelling, as directed by the City of Barrie.

Where a sewer is located within the floodplain of a watercourse, maintenance hole covers are to be raised above the maximum flood elevations, or watertight maintenance hole covers with associated air vents may be required as directed by the City.

3.4. Sanitary Sewer Design

3.4.1. Hydraulic Design Sheets

The design of sanitary sewers shall be completed using the City of Barrie's Sanitary Sewer Design Sheets as provided in Appendix C, or a similar format as deemed appropriate by the City.

3.4.2. Minimum Pipe Diameter

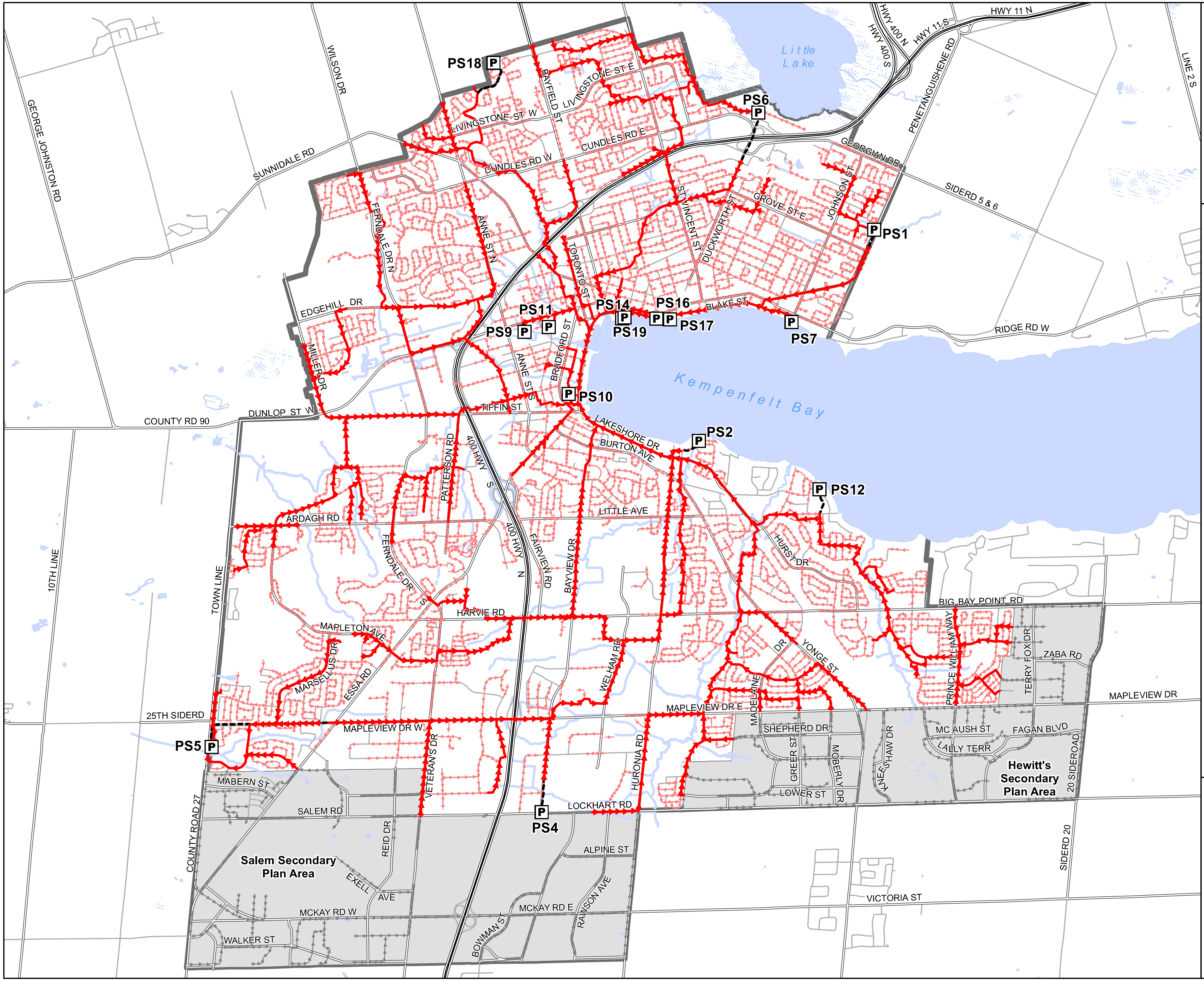
The minimum diameter for sanitary sewers conveying raw sewage from residential areas with no potential for future intensification or sanitary sewer shall be no less than 200mm in diameter (NPS-8). Sanitary sewers located in Industrial, Commercial, Institutional, and mixed land use areas shall be no less than 250 mm in diameter (NPS-10). The downstream sanitary sewer diameter shall be no less than the upstream sanitary sewer diameter.

3.4.3. Minimum and Maximum Velocities

Sanitary sewers shall be designed such that a minimum sewage flow velocity of 0.60 m/s is achieved without including inflow and infiltration flows. The actual velocity at peak flow conditions should be calculated and slope increased to ensure adequate flushing velocities are maintained. A sample spreadsheet is available on City of Barrie website, and can be reviewed in Appendix C.

In order to reduce pipe scour, the maximum flow velocity shall be 3 m/s. Velocities in excess of 3 m/s may be permitted in special situations, provided that slope anchors are used to prevent pipe separation, and measures are taken to protect against scour. If velocities above 3 m/s are proposed, documentation must be submitted to the City for approval, indicating potential risks and mitigative measures required to ensure the long term integrity of the collection system. Minimum calculated velocities shall not exceed full flow velocities.

Figure ES-1
City of Barrie
Existing Wastewater Collection System



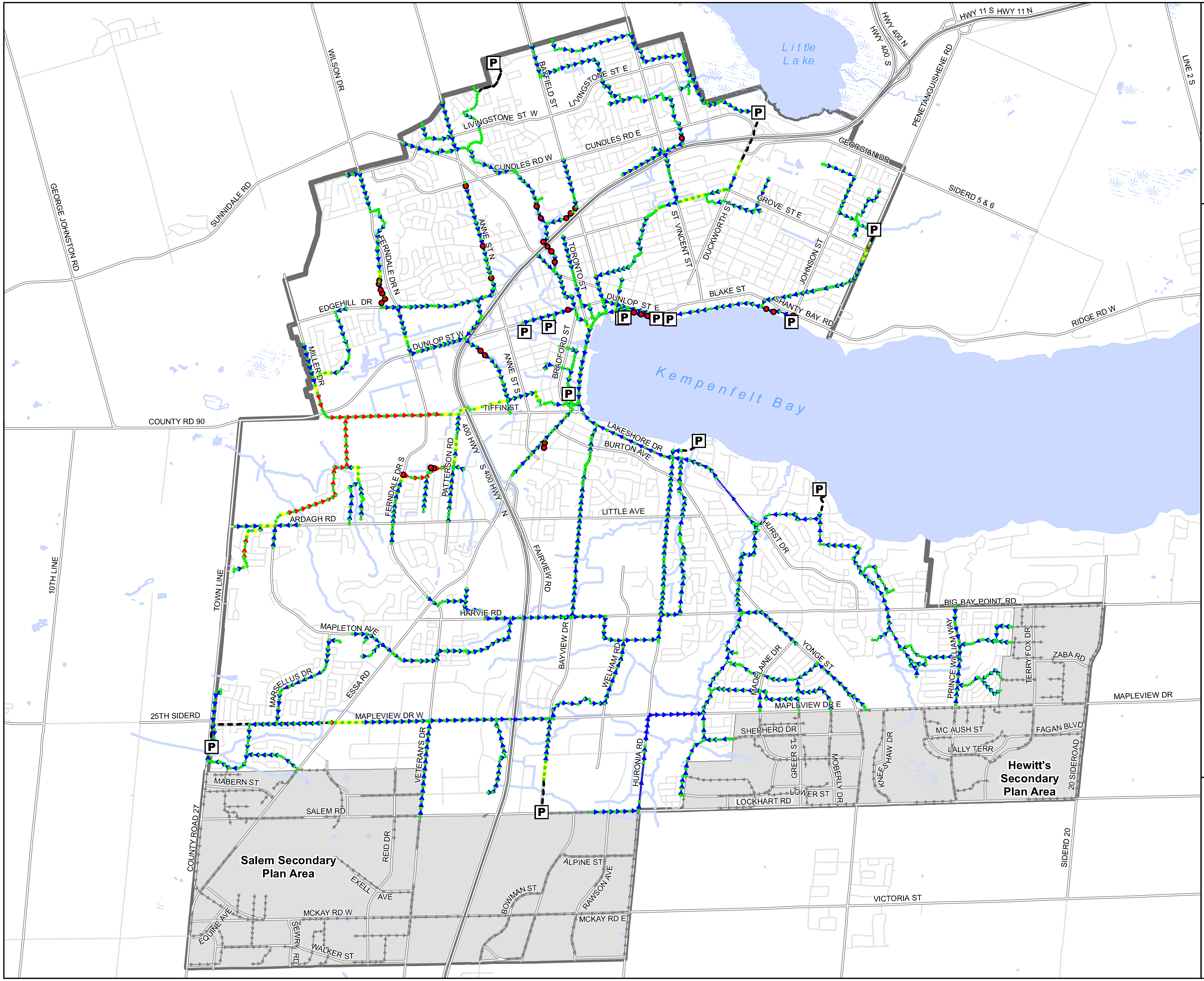
- 🅿 Pumping Stations
- ➜ Sanitary Trunk Sewer
- ╌ Forcemain
- → Sanitary Sewer
- → Future Annexed Lands Sewers
- ▭ Secondary Plan Boundaries
- ▭ City of Barrie Limits

N

0 0.25 0.5 1 1.5 2
Kilometers

Updated: 4/5/2019

Figure 6-6
City of Barrie
Existing Wastewater Collection System Performance Wet Weather Flow Conditions (25 Year Storm Event)



P Pumping Stations
Forcemain
Secondary Plan Boundaries
City of Barrie Limits
Future Annexed Lands Sewers

NewFreebrd25yr

● <= 1.8m
● > 1.8m

NewMaxFullDpth25yr

→ < 0.5
→ 0.5 - 0.7
→ > 0.7

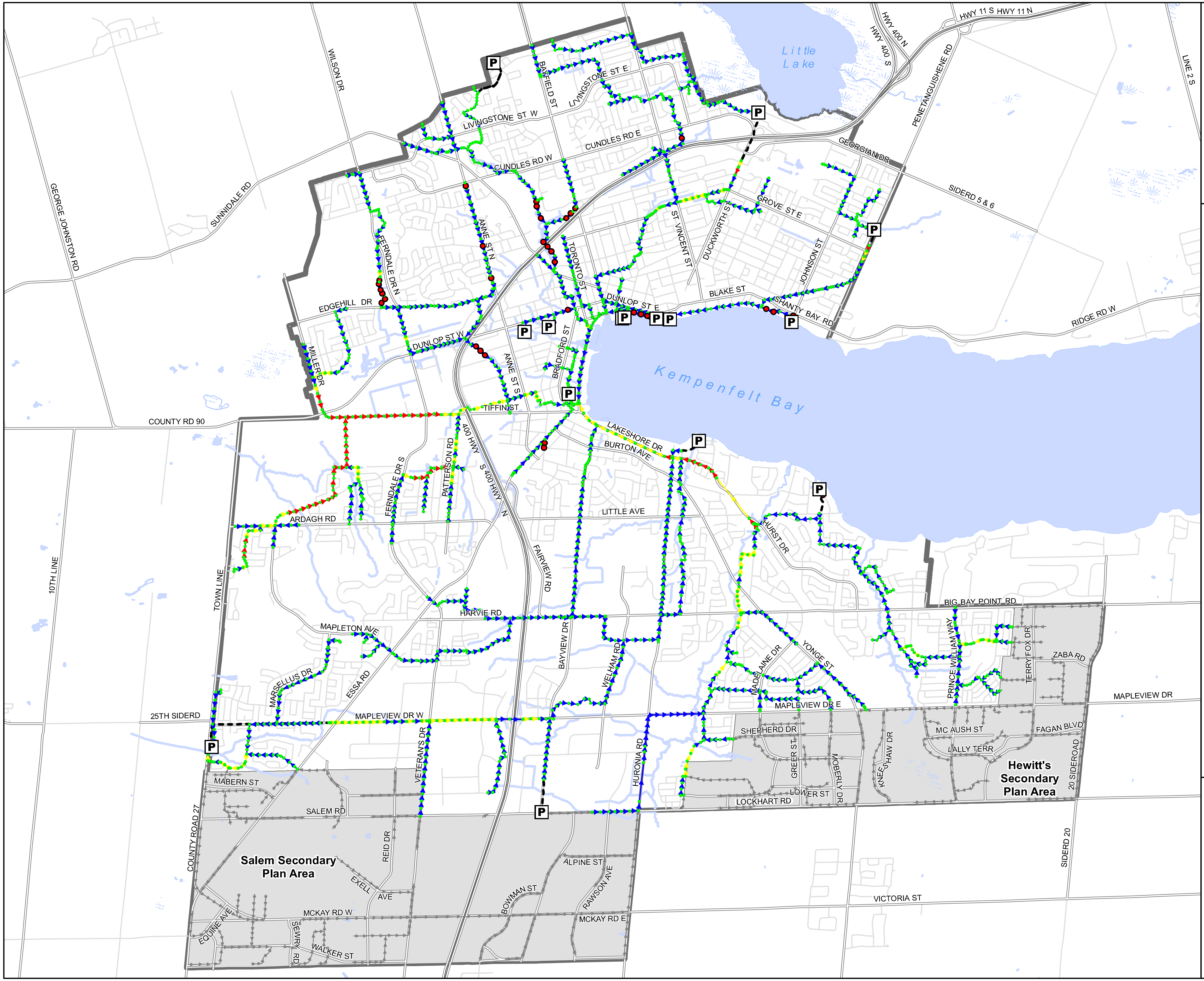
COLE

N

0 0.25 0.5 1 1.5 2
Kilometers

Updated: 4/5/2019

Figure 8-2
Existing Barrie Wastewater Collection System Performance with 2021 Wet Weather Conditions (25-Year Storm)



COLE

Updated: 4/5/2019

8.2.2 Evaluation of Existing Pumping Stations

The capacity of existing pump stations to convey future flows was also evaluated for the various planning horizons. For this analysis, peak modelled flows corresponding to the 25-year design event were compared against the firm capacity of each station. **Table 8.3** presents the results. The station firm capacity represents the current available capacity at each station while the 2017 Existing, 2021, 2026, 2031, 2036 and 2041 values represent the required capacity in the time period. It is noted that the Huronia PS has already been decommissioned and the Lockhart PS is planned to be decommissioned. In addition, the Holly PS is currently being expanded and the station firm capacity is being increased. The values shown in **Table 8.3** correspond to the post-construction firm capacity.

Table 8.3 Pumping Station Capacity Assessment (2017-2041)

Modelled Pumping Station	Station Firm Capacity (L/s)	2017 Existing Peak Flow Entering Station (L/s)	2021 Peak Flow Entering Station (L/s)	2026 Peak Flow Entering Station (L/s)	2031 Peak Flow Entering Station (L/s)	2036 Peak Flow Entering Station (L/s)	2041 Peak Flow Entering Station (L/s)
Barrie WwTF (PS10)	2,205	1,736	1,910	1,963	2,057	2,061	2,109
Grove Street (PS1)	158	53	52	54	54	57	63
Minets Point (PS2)	61.3	22.1	22.2	22.3	22.6	22.9	23.6
Huronia (PS3)	91	Decommissioned					
Lockhart (PS4)	51	5	Planned to Be Decommissioned				
Holly (PS5)	200.9	67	81	95	108	120	130
Little Lake (PS6)	110	37	37	40	40	41	42
Tynedale (PS12)	11	10	**15**	**15**	**16**	**16**	**16**
Mooregate (PS18)	21	8	8.5	8.5	8.7	8.9	9.1

It is noted that the influent flow to PS10 does not include any recycle streams. For PS10, the Wastewater Treatment Master Plan contains a detailed examination of future needs.

The results presented above indicated that all SPSs, with the exception of Tynedale SPS (PS12), have sufficient firm capacity to convey peak flows associated with the 25-year design event through to the year 2041. PS12 will require a pump capacity increase in the planning phase 2021.

BEAR CREEK RESIDENTIAL SUBDIVISION

City of Barrie

SANITARY SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Project Number: 19-11476B
Date: September 1, 2020
Design By: DH
Checked By: JV
File: Z:\Project Documents\11476B Bear Creek Village\PEL Functional Servicing Report - Rezoning\FSR\Design Sheets\Sanitary Sewer Design Sheet.xls

Drainage Area Plan No: SAN-1

Design Parameters

Average Daily Flow
Residential 0.0026 L/s/c

Mannings "*n*" 0.0130
Min. Velocity 0.60 m/sec
Max. Velocity 3.0 m/sec
Residential Harmon Peaking Factor (F)
Infiltration 0.10 L/s/ha

PINESTONE ENGINEERING LTD.

LOCATION				RESIDENTIAL AREAS and POPULATION						SCHOOL, INSTITUTIONAL			COMMERCIAL			INDUSTRIAL				INFILTRATION			DESIGN						
										HECTARES AND FLOW OF EACH ZONING																			
										0.00 *L/s/ha*			0.000 *L/s/ha*			0.00 *L/s/ha*													
STREET	AREA NO.	MANHOLE LOCATION FROM MH	TO MH	AREA	UNITS	POPUL.	CUMUL POPUL.	PEAK FACTOR "F"	PEAK RES. FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	TOTALS-C-I FLOW	AREA	CUMUL AREA	INFIL FLOW	TOTAL VOLUME FLOW	LENGTH	SLOPE	PIPE SIZE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
				ha		*1000s*	*1000s*		*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*m*	*%*	*mm*	*L/sec.*	*m/s*	*m/s*
	201	1	2	0.38	90.00	0.211	0.211	4.13978	2.2668											0.38	0.380	0.0380	2.3047777	16.5	1.00	200	32.78178	1.04400573	0.60119385
	202	2	3	0.28	16.00	0.037	0.248	4.112469	2.6521											0.28	0.660	0.0660	2.71814799	51.5	1.00	200	32.78178	1.04400573	0.63109228
	203	3	14	0.54	22.00	0.051	0.300	4.078761	3.1763											0.54	1.200	0.1200	3.29634307	88	0.80	200	29.3209154	0.93378712	0.61768409
	204	4	5	0.33	24.00	0.056	0.056	4.304239	0.6285											0.33	0.330	0.0330	0.66148783	60.2	0.80	200	29.3209154	0.93378712	0.3822483
	205	5	6	0.28	25.00	0.059	0.115	4.226836	1.2601											0.28	0.610	0.0610	1.32108754	62.3	0.80	200	29.3209154	0.93378712	0.47060689
	206	6	8	0.13	9.00	0.021	0.136	4.204833	1.4838											0.13	0.740	0.0740	1.55776793	40	1.00	200	32.78178	1.04400573	0.53542625
	207	7	8	0.33	23.00	0.054	0.054	4.308135	0.6028											0.33	0.330	0.0330	0.63584599	78.5	0.80	200	29.3209154	0.93378712	0.37827632
	208	8	9	0.27	27.00	0.063	0.253	4.109237	2.7001											0.27	1.340	0.1340	2.83406447	65.4	0.80	200	29.3209154	0.93378712	0.59032151
	209	9	14	0.03	2.00	0.005	0.257	4.106041	2.7479											0.03	1.370	0.1370	2.88492664	15.1	0.80	200	29.3209154	0.93378712	0.59337333
	210	6	12	0.09	6.00	0.014	0.014	4.399304	0.1606											0.09	0.090	0.0090	0.16959218	38	1.00	200	32.78178	1.04400573	0.27275668
	211	10	11	0.33	23.00	0.054	0.054	4.308135	0.6028											0.33	0.330	0.0330	0.63584599	52	0.80	200	29.3209154	0.93378712	0.37827632
	212	11	12	0.24	24.00	0.056	0.110	4.232038	1.2101											0.24	0.570	0.0570	1.26714278	57	0.80	200	29.3209154	0.93378712	0.46441272
	213	12	13	0.11	7.00	0.016	0.140	4.20022	1.5332											0.11	0.770	0.0770	1.61024814	50.5	0.80	200	29.3209154	0.93378712	0.49913127
	214	13	14	0.13	10.00	0.023	0.164	4.178407	1.7795											0.13	0.900	0.0900	1.86950001	44.9	0.80	200	29.3209154	0.93378712	0.52234222
	215	14	15	0.05			0.721	3.887222	7.2842											0.05	3.470	0.3470	7.63115579	31	4.20	200	67.1826572	2.13957507	1.41927053
	216	15	EX				0.721	3.887222	7.2842												3.470	0.3470	7.63115579	13	2.00	250	84.057073	1.71326518	1.06413987
													CAPACITY OF IMMEDIATE DOWNSTREAM REACH OF 525mm DIA. SANITARY TRUNK SEWER =											89	0.10	525	135.928594	0.62823563	

Sanitary Flows Based on the City of Barrie Sanitary Sewage Collection System Policies and Design Guideline, 2017

Population Density Based on the following:
Residential Unit 2.34 pp/unit

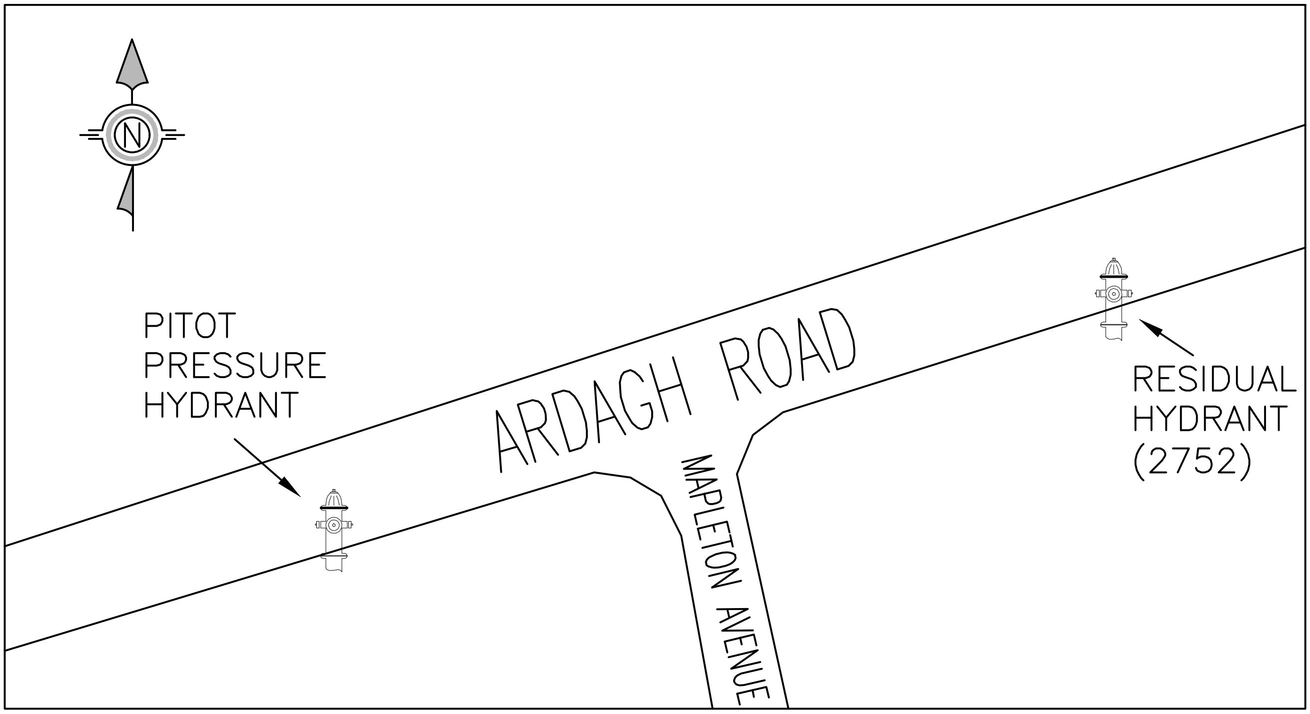
FIRST FOR FIRE, LIFE SAFETY & SECURITY
VIPOND INC
est. 1945

FLOW TEST RESULTS

DATE : TUESDAY SEPTEMBER 22, 2020 TIME : 1:20 PM

LOCATION : ARDAGH ROAD & MAPLETON AVENUE
BARRIE
ONTARIO

TEST BY : VIPOND FIRE PROTECTION AND LOCAL PUC



STATIC PRESSURE : 91 PSI

UNDERGROUND TYPE & SIZE: 12" PVC

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1-3/4	0.995	75	61	695
2	1	2-1/2	0.9	80	32	954
3	2	2-1/2	0.9	70	26	1720

FIRST FOR FIRE, LIFE SAFETY & SECURITY
VIPOND INC
est. 1945

ARDAGH ROAD & MAPLETON AVENUE
BARRIE
ONTARIO

BY : GUS A.
OFFICE : BARRIE
TEST BY : VIPOND & PUC
DATE : SEPTEMBER 22, 2020

STATIC: 91 PSI

STATIC:		RESIDUAL:		FLOW:
91 PSI	TEST#1	75 PSI	@	695 GPM
	TEST#2	80 PSI	@	954 GPM
	TEST#3	70 PSI	@	1720 GPM

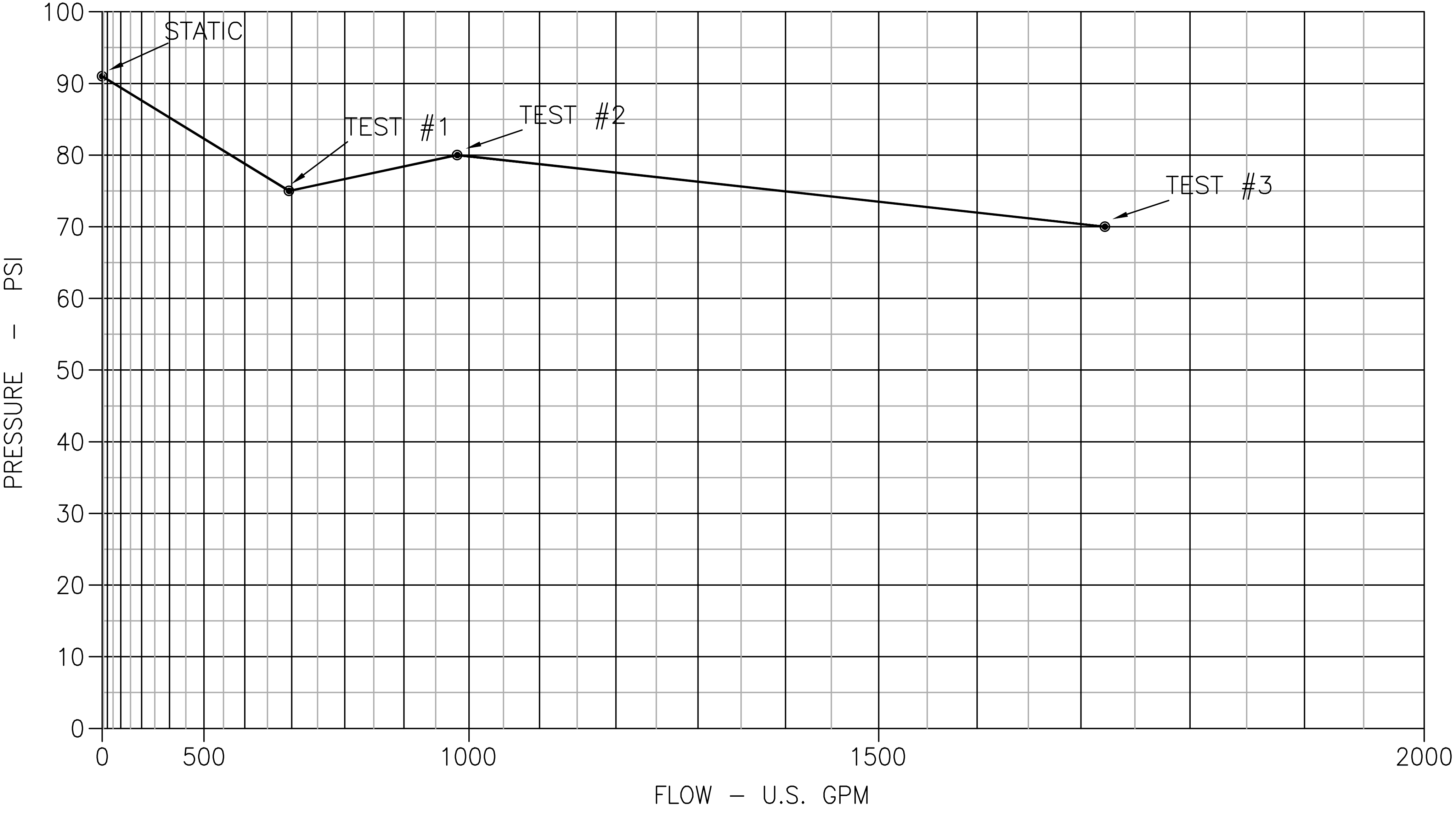


Table 3-5 Maximum Day Factor and Average Daily Demand Per Capita Per Zone

	ZONE 1	ZONE 2N	ZONE 3N	ZONE 2S	ZONE 3S
Maximum Day Factor from 2015 to 2017 [1]	2.30	1.66	2.41	2.32	1.63
Maximum Day Factor for Established Population	2.30	1.80	2.41	2.32	1.80
Maximum Day Factor for Future Population [2]					
2021	1.90	1.80	2.00	1.75	1.80
2026	1.80	1.80	2.00	1.75	1.80
2031	1.80	1.75	2.00	1.75	1.80
2036	1.80	1.75	2.00	1.65	1.80
2041	1.80	1.75	2.00	1.65	1.80
2071	1.75	1.75	1.90	1.65	1.75
Average Daily Demand Per Capita (Lpcd) for Established and Future Population [3]	174	162	210	129	224

[1] Based on the maximum day factor of each zone found in Table 3-2, Table 3-3 and Table 3-4.

[2] The maximum day factors for the future population were based on Table 3-1: Peaking factors of *Design Guidelines For-Drinking Water Systems, 2008* from MECP, according to the total equivalent population of each projected year.

[3] The average daily demand each zone was calculated based on the average daily demand per capita found in Table 3-2, Table 3-3 and Table 3-4.

The combined population projections, average day demand and maximum day demand projections to ultimate buildout are summarized in Table 3-6. The demands associated with growth in the Salem and Hewitts Secondary Plan Areas have been included in Zones 2S and 3S.

WATER SERVICE AREAS

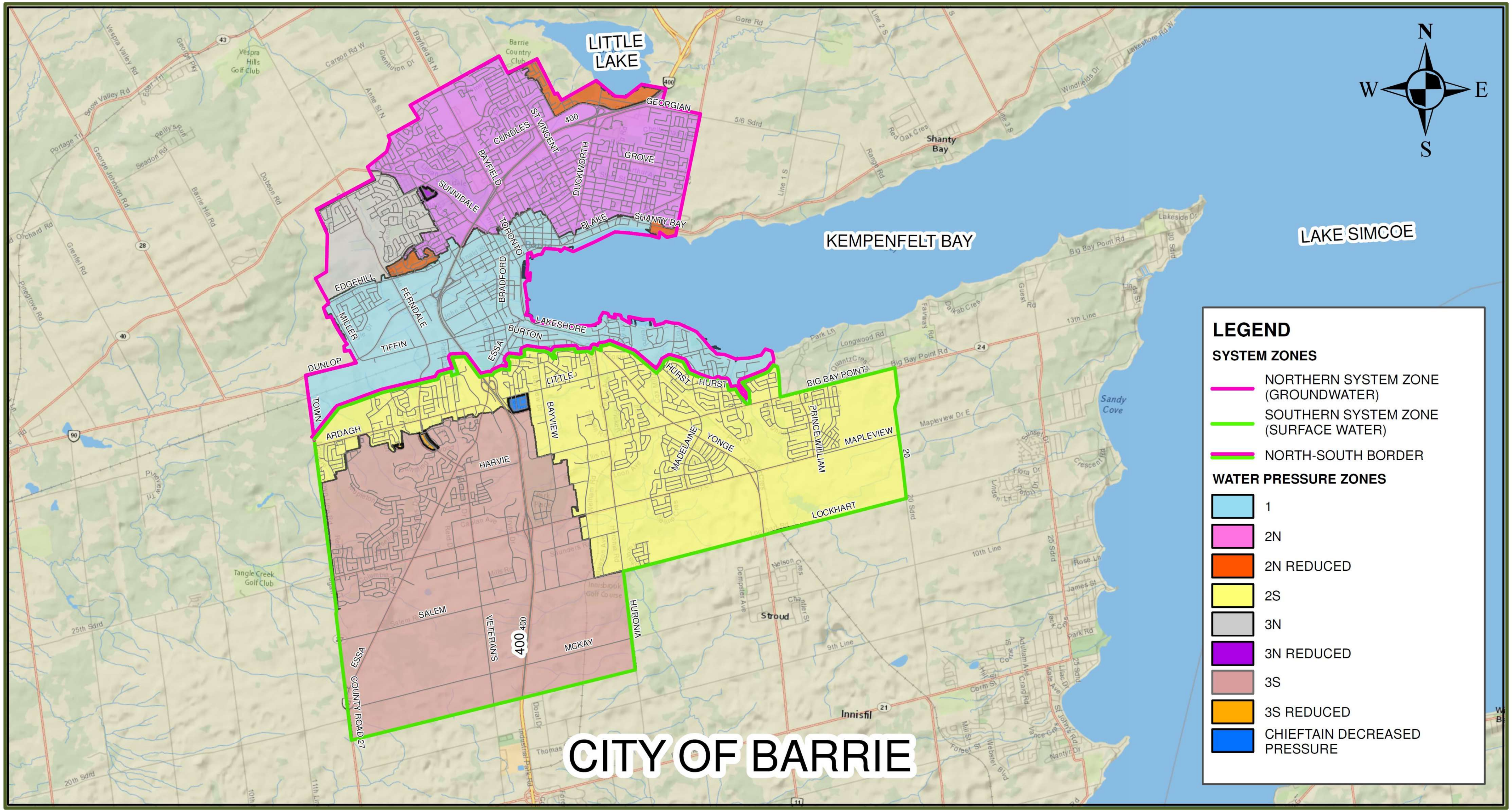


Table 3-1: Peaking Factors

POPULATION	MINIMUM RATE FACTOR (MINIMUM HOUR)	MAXIMUM DAY FACTOR	PEAK RATE FACTOR (PEAK HOUR)
500 - 1 000	0.40	2.75	4.13
1 001 - 2 000	0.45	2.50	3.75
2 001 - 3 000	0.45	2.25	3.38
3 001 - 10 000	0.50	2.00	3.00
10 001 - 25 000	0.60	1.90	2.85
25 001 - 50 000	0.65	1.80	2.70
50 001 - 75 000	0.65	1.75	2.62
75 001 -150 000	0.70	1.65	2.48
greater than 150 000	0.80	1.50	2.25

3.4.3 Commercial and Institutional Water Demands

Institutional and commercial flows should be determined by using historical records, where available. Where no records are available, the values in Table 3.2 should be used. For other commercial and tourist-commercial areas, an allowance of 28 m^3/(ha·d) [3000 USgal/(acre·d)] average flow should be used in the absence of reliable flow data.

When using the above unit demands, maximum day and peak rate factors should be developed. For establishments in operation for only a portion of the day such as schools and shopping plazas, the water usage should also be factored accordingly. For instance, with schools operating for 8 hours per day, the water use rate would be at an average rate of 70 L/(student·day) [19 USgal/(student·day)] x 24/8 or 210 L/student (55 USgal/student) over the 8-hour period of operation. The water use will drop to a residual amount during the remainder of the day. Schools generally do not exhibit large maximum day to average day ratios and a factor of 1.5 will generally cover this variation. For estimation of ***peak demand*** rates, an assessment of the water-using fixtures is generally necessary and a fixture-unit approach should be used.

BEAR CREEK RESIDENTIAL DEVELOPMENT - CITY OF BARRIE
WATERMAIN NETWORK ANALYSIS

File: 19-11476B
Date: 2020-09-25

NODE	PIPE ELEVATION (m)	# of Units	POPULATION	WATER DEMAND AVE DAY (L/S)	 MAX DAY (L/S)	 PEAK HOURLY (L/S)	Size (mm)
VP1	237.78	0	0	0.00	0.00	0.00	300
J1	236.76	0	0	0.00	0.00	0.00	250
J2	239.05	0	0	0.00	0.00	0.00	250
J3	239.10	0	0	0.00	0.00	0.00	250
FH#1	239.10	0	0	0.00	0.00	0.00	150
J4	239.05	22	51.48	0.08	0.13	0.17	250
J5	238.95	106	248.04	0.37	0.65	0.83	250
FH#2	238.95	0	0	0.00	0.00	0.00	150
J6	239.45	52	121.68	0.18	0.32	0.41	250
J7	239.25	15	35.1	0.05	0.09	0.12	250
J8	239.25	0	0	0.00	0.00	0.00	250
FH#3	239.25	0	0	0.00	0.00	0.00	150
J9	239.80	93	217.62	0.32	0.57	0.73	250
FH#4	240.00	3	7.02	0.01	0.02	0.02	150
J10	239.00	17	39.78	0.06	0.10	0.13	250
TOTALS		308.00	720.72	1.08	1.88	2.42	

Notes:
1) Water demands based on 2.34 people per unit at 129 litres/person/day
2) Max day factor = 1.75 and peaking factor = 2.25 as per MECP and City of Barrie Guidelines
3) Fire demand of 177L/s used at FH#2

Fire Flow Calculations – Fire Underwriters Survey 1999

Building Area = Apartment building @ 827 m^2 /floor @ 5 floors = 4,135 m^2

(The 5-storey apartment building was chosen because it is the worst-case scenario for total floor area and exposure charges.)

Fire demands for the proposed development were calculated in accordance with the Fire Underwriters Survey (FUS) as follows:

$$F = 220C(A)^{0.5}$$

Where, F = the required fire flow in litres per minute.

C = coefficient related to the type of construction.

A = total floor area of building (excluding basements) calculated as per FUS

C = 0.8 for non-combustible construction

F = 220*0.8*(4,135) ^0.5
F = 11,318 L/min
F = 189 L/sec

Reductions:

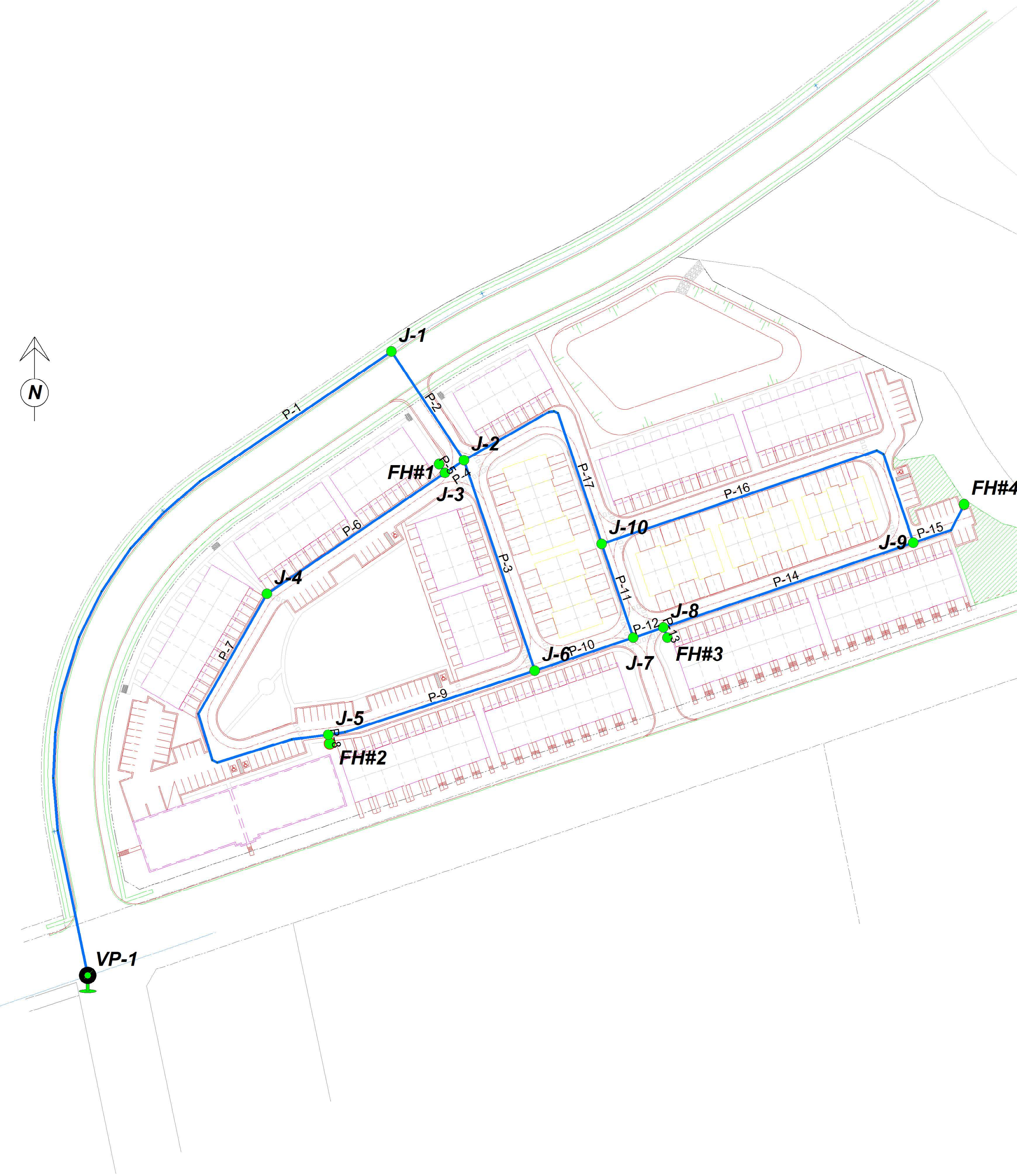
Reduction for low hazard occupancy (-25%)
Fire Flow = 142 L/sec

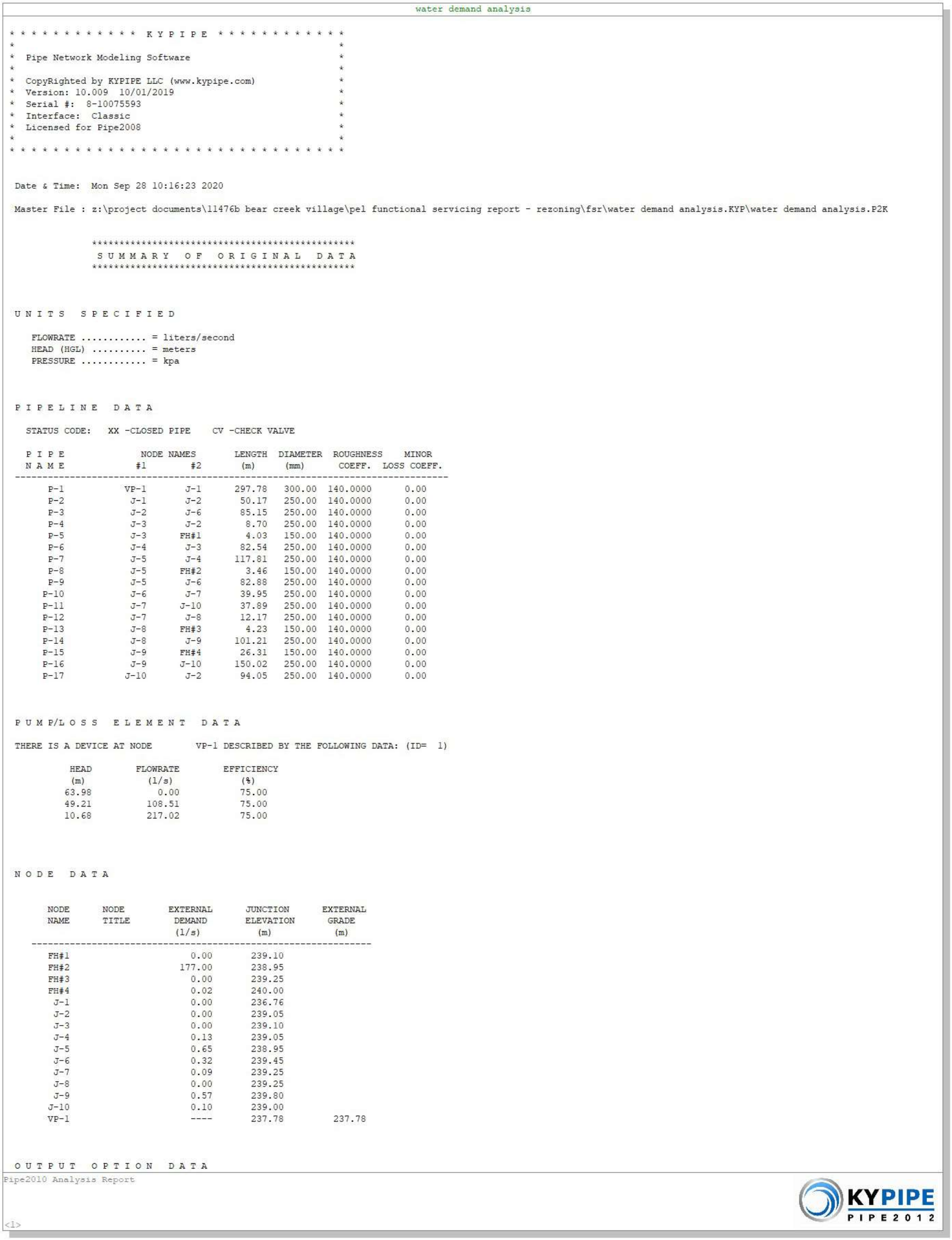
Reduction for sprinkler system in conformance with NFPA standards (-30%)
Fire Flow = 99 L/sec

Exposure charge for proposed building to the north (+5%)
Exposure charge for existing building to the south (+5%)
Exposure charge for existing building to the east (+20%)
Exposure charge for existing building to the west (+25%)

Total charge = +55% or 78 L/sec on the 155 L/sec fire flow

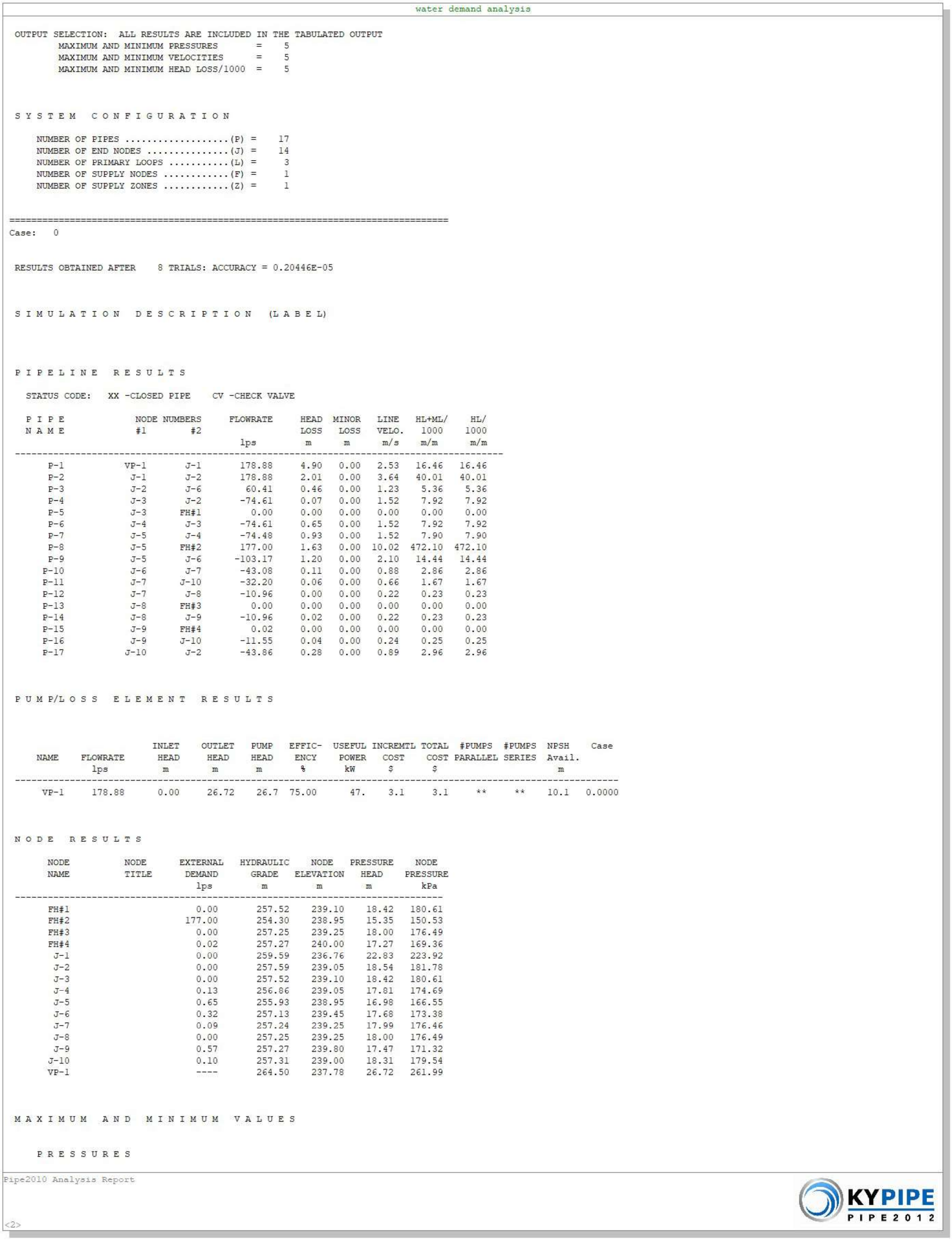
Required fire flow as per FUS 1999 calculation = 177 L/sec


N
J-1
P-1
P-2
J-2
FH#1
P-5
P-4
J-3
P-6
P-17
P-3
J-10
P-16
FH#4
J-9
P-15
J-4
P-11
P-14
J-8
P-7
P-12
P-13
P-10
J-6
J-7
FH#3
P-9
J-5
P-8
FH#2
VP-1



water demand analysis

```
* * * * * * * * * * * *  K Y P I P E  * * * * * * * * * * * *
*                                                            *
*  Pipe Network Modeling Software                            *
*                                                            *
*  CopyRighted by KYPIPE LLC (www.kypipe.com)                *
*  Version: 10.009  10/01/2019                               *
*  Serial #:  8-10075593                                     *
*  Interface:  Classic                                       *
*  Licensed for Pipe2008                                     *
*                                                            *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *


 Date & Time:  Mon Sep 28 10:16:23 2020

 Master File : z:\project documents\11476b bear creek village\pel functional servicing report - rezoning\fsr\water demand analysis.KYP\water demand analysis.P2K


              ***********************************************
               S U M M A R Y   O F   O R I G I N A L   D A T A
              ***********************************************


 U N I T S   S P E C I F I E D

    FLOWRATE ............ = liters/second
    HEAD (HGL) .......... = meters
    PRESSURE ............ = kpa



 P I P E L I N E   D A T A

   STATUS CODE:   XX -CLOSED PIPE    CV -CHECK VALVE

   P I P E             NODE NAMES       LENGTH  DIAMETER  ROUGHNESS    MINOR
   N A M E           #1        #2        (m)      (mm)       COEFF.  LOSS COEFF.
 -------------------------------------------------------------------------------

       P-1          VP-1      J-1      297.78   300.00  140.0000      0.00
       P-2           J-1      J-2       50.17   250.00  140.0000      0.00
       P-3           J-2      J-6       85.15   250.00  140.0000      0.00
       P-4           J-3      J-2        8.70   250.00  140.0000      0.00
       P-5           J-3      FH#1       4.03   150.00  140.0000      0.00
       P-6           J-4      J-3       82.54   250.00  140.0000      0.00
       P-7           J-5      J-4      117.81   250.00  140.0000      0.00
       P-8           J-5      FH#2       3.46   150.00  140.0000      0.00
       P-9           J-5      J-6       82.88   250.00  140.0000      0.00
      P-10           J-6      J-7       39.95   250.00  140.0000      0.00
      P-11           J-7      J-10      37.89   250.00  140.0000      0.00
      P-12           J-7      J-8       12.17   250.00  140.0000      0.00
      P-13           J-8      FH#3       4.23   150.00  140.0000      0.00
      P-14           J-8      J-9      101.21   250.00  140.0000      0.00
      P-15           J-9      FH#4      26.31   150.00  140.0000      0.00
      P-16           J-9      J-10     150.02   250.00  140.0000      0.00
      P-17          J-10      J-2       94.05   250.00  140.0000      0.00



 P U M P/L O S S   E L E M E N T   D A T A

 THERE IS A DEVICE AT NODE        VP-1 DESCRIBED BY THE FOLLOWING DATA: (ID=  1)

           HEAD        FLOWRATE        EFFICIENCY
            (m)          (l/s)            (%)
          63.98           0.00           75.00
          49.21         108.51           75.00
          10.68         217.02           75.00




 N O D E   D A T A


      NODE      NODE       EXTERNAL      JUNCTION      EXTERNAL
      NAME      TITLE       DEMAND       ELEVATION      GRADE
                            (l/s)          (m)           (m)
   --------------------------------------------------------------

      FH#1                    0.00       239.10
      FH#2                  177.00       238.95
      FH#3                    0.00       239.25
      FH#4                    0.02       240.00
       J-1                    0.00       236.76
       J-2                    0.00       239.05
       J-3                    0.00       239.10
       J-4                    0.13       239.05
       J-5                    0.65       238.95
       J-6                    0.32       239.45
       J-7                    0.09       239.25
       J-8                    0.00       239.25
       J-9                    0.57       239.80
      J-10                    0.10       239.00
      VP-1                    ----       237.78         237.78



 O U T P U T   O P T I O N   D A T A
```



water demand analysis

```
 OUTPUT SELECTION:  ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT
        MAXIMUM AND MINIMUM PRESSURES       =    5
        MAXIMUM AND MINIMUM VELOCITIES      =    5
        MAXIMUM AND MINIMUM HEAD LOSS/1000  =    5



 S Y S T E M   C O N F I G U R A T I O N

     NUMBER OF PIPES ....................(P) =    17
     NUMBER OF END NODES ................(J) =    14
     NUMBER OF PRIMARY LOOPS ............(L) =     3
     NUMBER OF SUPPLY NODES .............(F) =     1
     NUMBER OF SUPPLY ZONES .............(Z) =     1


================================================================================
Case:   0


 RESULTS OBTAINED AFTER    8 TRIALS: ACCURACY = 0.20446E-05



 S I M U L A T I O N   D E S C R I P T I O N   (L A B E L)




 P I P E L I N E   R E S U L T S

   STATUS CODE:  XX -CLOSED PIPE    CV -CHECK VALVE

   P I P E          NODE NUMBERS    FLOWRATE      HEAD  MINOR   LINE   HL+ML/    HL/
   N A M E           #1       #2                  LOSS   LOSS   VELO.   1000    1000
                                       lps          m      m     m/s    m/m      m/m
 ----------------------------------------------------------------------------------------
       P-1          VP-1     J-1      178.88      4.90   0.00   2.53   16.46   16.46
       P-2           J-1     J-2      178.88      2.01   0.00   3.64   40.01   40.01
       P-3           J-2     J-6       60.41      0.46   0.00   1.23    5.36    5.36
       P-4           J-3     J-2      -74.61      0.07   0.00   1.52    7.92    7.92
       P-5           J-3     FH#1       0.00      0.00   0.00   0.00    0.00    0.00
       P-6           J-4     J-3      -74.61      0.65   0.00   1.52    7.92    7.92
       P-7           J-5     J-4      -74.48      0.93   0.00   1.52    7.90    7.90
       P-8           J-5     FH#2     177.00      1.63   0.00  10.02  472.10  472.10
       P-9           J-5     J-6     -103.17      1.20   0.00   2.10   14.44   14.44
      P-10           J-6     J-7      -43.08      0.11   0.00   0.88    2.86    2.86
      P-11           J-7     J-10     -32.20      0.06   0.00   0.66    1.67    1.67
      P-12           J-7     J-8      -10.96      0.00   0.00   0.22    0.23    0.23
      P-13           J-8     FH#3       0.00      0.00   0.00   0.00    0.00    0.00
      P-14           J-8     J-9      -10.96      0.02   0.00   0.22    0.23    0.23
      P-15           J-9     FH#4       0.02      0.00   0.00   0.00    0.00    0.00
      P-16           J-9     J-10     -11.55      0.04   0.00   0.24    0.25    0.25
      P-17          J-10     J-2      -43.86      0.28   0.00   0.89    2.96    2.96



 P U M P/L O S S   E L E M E N T   R E S U L T S



                           INLET    OUTLET   PUMP   EFFIC-  USEFUL INCREMTL TOTAL  #PUMPS  #PUMPS  NPSH    Case
     NAME     FLOWRATE     HEAD     HEAD     HEAD    ENCY    POWER   COST    COST PARALLEL SERIES  Avail.
                lps          m        m        m      %       kW      $       $                    m
 ------------------------------------------------------------------------------------------------------------
     VP-1     178.88      0.00     26.72    26.7  75.00      47.     3.1     3.1     **      **    10.1   0.0000



 N O D E   R E S U L T S

       NODE          NODE       EXTERNAL   HYDRAULIC    NODE    PRESSURE     NODE
       NAME          TITLE       DEMAND      GRADE    ELEVATION   HEAD     PRESSURE
                                  lps          m          m         m         kPa
 -----------------------------------------------------------------------------------
       FH#1                        0.00      257.52    239.10     18.42    180.61
       FH#2                      177.00      254.30    238.95     15.35    150.53
       FH#3                        0.00      257.25    239.25     18.00    176.49
       FH#4                        0.02      257.27    240.00     17.27    169.36
        J-1                        0.00      259.59    236.76     22.83    223.92
        J-2                        0.00      257.59    239.05     18.54    181.78
        J-3                        0.00      257.52    239.10     18.42    180.61
        J-4                        0.13      256.86    239.05     17.81    174.69
        J-5                        0.65      255.93    238.95     16.98    166.55
        J-6                        0.32      257.13    239.45     17.68    173.38
        J-7                        0.09      257.24    239.25     17.99    176.46
        J-8                        0.00      257.25    239.25     18.00    176.49
        J-9                        0.57      257.27    239.80     17.47    171.32
       J-10                        0.10      257.31    239.00     18.31    179.54
       VP-1                        ----      264.50    237.78     26.72    261.99



 M A X I M U M   A N D   M I N I M U M   V A L U E S



     P R E S S U R E S
```

Pipe2010 Analysis Report

<2>

```
          JUNCTION     MAXIMUM              JUNCTION     MINIMUM
           NUMBER     PRESSURES              NUMBER     PRESSURES
                         kPa                               kPa
          ---------------------             ---------------------
           VP-1        261.99                FH#2        150.53
            J-1        223.92                 J-5        166.55
            J-2        181.78                FH#4        169.36
           FH#1        180.61                 J-9        171.32
            J-3        180.61                 J-6        173.38

     V E L O C I T I E S

            PIPE       MAXIMUM                PIPE       MINIMUM
           NUMBER     VELOCITY               NUMBER     VELOCITY
                        (m/s)                             (m/s)
          ---------------------             ---------------------
            P-8         10.02                P-15          0.00
            P-2          3.64                P-12          0.22
            P-1          2.53                P-14          0.22
            P-9          2.10                P-16          0.24
            P-4          1.52                P-11          0.66

     H L + M L  /  1 0 0 0

            PIPE       MAXIMUM                PIPE       MINIMUM
           NUMBER    HL+ML/1000               NUMBER    HL+ML/1000
                        (m/m)                              (m/m)
          ---------------------             ---------------------
            P-8        472.10                P-15          0.00
            P-2         40.01                P-14          0.23
            P-1         16.46                P-12          0.23
            P-9         14.44                P-16          0.25
            P-6          7.92                P-11          1.67

     H L  /  1 0 0 0

            PIPE       MAXIMUM                PIPE       MINIMUM
           NUMBER     HL/1000                NUMBER     HL/1000
                        (m/m)                             (m/m)
          ---------------------             ---------------------
            P-8        472.10                P-15          0.00
            P-2         40.01                P-14          0.23
            P-1         16.46                P-12          0.23
            P-9         14.44                P-16          0.25
            P-6          7.92                P-11          1.67


 S U M M A R Y   O F   I N F L O W S   A N D   O U T F L O W S

 (+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
 (-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

        NODE         FLOWRATE        NODE
        NAME          lps            TITLE
     --------------------------------------------
      VP-1             178.88

 NET SYSTEM INFLOW  =    178.88
 NET SYSTEM OUTFLOW =      0.00
 NET SYSTEM DEMAND  =    178.88
================================================================================
Total Power Cost



              ***************************************************

              TOTAL POWER COST($) FOR THIS SIMULATION =      3.12

              ***************************************************


           ***** HYDRAULIC ANALYSIS COMPLETED *****
```

APPENDIX D

SWM Design Calculations

BEAR CREEK RESIDENTIAL DEVELOPMENT

PRE-DEVELOPMENT SWM INPUT PARAMETERS - CITY OF BARRIE / NVCA JURISDICTION

Barrie, Ontario

PEL PINESTONE ENGINEERING LTD.

Project Number:	19-11476B
Date:	August 17th, 2020
Design By:	DH
File:	Z:\Project Documents\11476B Bear Creek Village\PEL Functional Servicing Report - Rezoning\FSR\HYMO SWM Calculations - DH.xls

Runoff Coefficients

Land Use	"C"
Lawns & Parks	0.10
Unimproved areas	0.10
Single Family Rooftop Area	0.95
Semi-detached Rooftop Area	0.95
Townhouse Rooftop Area	0.95
Medium/High Density Impervious Area	0.95
Woodland	0.08
Pasture/Meadow	0.10
Paved areas	0.95

* Values taken from the NVCA SWM Guidelines (2013)

Pre-Development Runoff Coefficients:

Catchment	Total Area (m^2)	Green Field & Parks Area (m^2)	Unimproved Area (m^2)	Single Family Rooftop Area (m^2)	Semi-detached Rooftop Area (m^2)	Townhouse Rooftop Area (m^2)	Medium/High Density Impervious Area (m^2)	Woodland Area (m^2)	Pasture/Meadow Area (m^2)	Paved Area (m^2)	Weighted C
101	44,900							44,900			0.08

Time of Concentration Calculations:

Catchment Parameters

Catchment ID	=	101	
Catchment Area	=	4.4900	ha
Flow Length	=	180	m
Slope	=	0.028	m/m
Weighted Runoff Coefficient	=	0.08	

Time of Concentration Results

Bransby Williams Formula (use for C>=0.4)	=	7.2	min.
Airport Formula (use for C<0.4)	=	31.8	min.

Time to Peak

2/3 of Time of Concentration	=	0.35	hr

Pre-Development Curve Number (CN):

Catchment	Hydrologic Soil Group	Soil Texture	Total Area (m^2)	Lakes / Wetlands / SWMF's (m^2)	Forest / Woodlot Area (m^2)	Meadow / Field Area (m^2)	Lawn / Grass Area (m^2)	Crop Area (m^2)	Impervious Area (m^2)	Weighted CN
101	A	Sand	44,900		44,900				0	25.0

SCS Curve Numbers

Cover	A	AB	B	BC	C	CD	D
	Hydrologic Soil Group						
Wetlands / Lakes/ SWMF's	50	50	50	50	50	50	50
Forest/Woodlot	25	40	55	63	70	74	77
Meadow/Field	30	44	58	65	71	75	78
Lawn/Grass	39	50	61	68	74	77	80
Crop	62	67	71	75	78	80	81
Impervious Areas	100	100	100	100	100	100	100

* Values taken from the NVCA SWM Guidelines (2013) and the City of Barrie SWM Guidelines (2020)

Pre-Development Initial Abstraction (IA):

Catchment	Total Area (m^2)	Lawn/Grass Area (m^2)	Forest/Woodlot Area (m^2)	Lakes / Wetlands SWMF (m^2)	Meadow/Field Area (m^2)	Crop Area (m^2)	Impervious Area (m^2)	Weighted IA
101	44,900	0	44,900	0			0	10.0

Initial Abstraction / Depression Storage

Cover	Depth (mm)
Wetlands / Lakes/ SWMF	0
Forest/Woodlot	10
Meadow/Field	8
Lawn/Grass	5
Crop	7
Impervious Areas	2

* Values taken from the NVCA SWM Guidelines (2013)

BEAR CREEK RESIDENTIAL DEVELOPMENT
POST DEVELOPMENT SWM INPUT PARAMETERS - CITY OF BARRIE / NVCA JURISDICTION
Barrie, Ontario

Project Number:	19-11476B
Date:	August 17th, 2020
Design By:	DH
File:	Z:\Project Documents\11476B Bear Creek Village\PEL Functional Servicing Report - Rezoning\FSR\HYMO SWM Calculations - DH.xls

PINESTONE ENGINEERING LTD.

Runoff Coefficients	
Land Use	**"C"**
Lawns & Parks	0.10
Unimproved areas	0.10
Single Family Rooftop Area	0.95
Semi-detached Rooftop Area	0.95
Townhouse Rooftop Area	0.95
Medium/High Density Impervious Area	0.95
Woodland	0.08
Pasture/Meadow	0.10
Paved areas	0.95

* Values taken from the NVCA SWM Guidelines (2013)

Post Development Runoff Coefficients:

Catchment	Total Area (m^2)	Green Field & Parks Area (m^2)	Unimproved Area (m^2)	Single Family Rooftop Area (m^2)	Semi-detached Rooftop Area (m^2)	Townhouse Rooftop Area (m^2)	Medium/High Density Impervious Area (m^2)	Woodland Area (m^2)	Pasture/Meadow Area (m^2)	Paved Area (m^2)	Weighted C
201	41,180	12,380				13,310				15,490	0.69
202	3,720	2,915								805	0.28

Time of Concentration Calculations:

Catchment Parameters			
Catchment ID	=	201	
Catchment Area	=	4.1180	ha
Flow Length	=	60	m
Slope	=	0.01	m/m
Weighted Runoff Coefficient	=	0.69	
Time of Concentration Results			
Bransby Williams Formula (use for C>=0.4)	=	3.0	min.
Airport Formula (use for C<0.4)	=	10.2	min.
Time to Peak			
2/3 of Time of Concentration	=	0.03	hr

Catchment Parameters			
Catchment ID	=	202	
Catchment Area	=	0.3720	ha
Flow Length	=	25	m
Slope	=	0.02	m/m
Weighted Runoff Coefficient	=	0.28	
Time of Concentration Results			
Bransby Williams Formula (use for C>=0.4)	=	1.4	min.
Airport Formula (use for C<0.4)	=	10.6	min.
Time to Peak			
2/3 of Time of Concentration	=	0.12	hr

Post Development Curve Number (CN):

Catchment	Hydrologic Soil Group	Soil Texture	Total Area (m^2)	Lakes / Wetlands / SWMF's (m^2)	Forest / Woodlot Area (m^2)	Meadow / Field Area (m^2)	Lawn / Grass Area (m^2)	Crop Area (m^2)	Impervious Area (m^2)	Weighted CN
201	A	Sand	41,180	3,800			8,580		28,800	82.7
202	A	Sand	3,720				2,915		805	52.2

SCS Curve Numbers							
	Hydrologic Soil Group						
Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**
Wetlands / Lakes/ SWMF's	50	50	50	50	50	50	50
Forest/Woodlot	25	40	55	63	70	74	77
Meadow/Field	30	44	58	65	71	75	78
Lawn/Grass	39	50	61	68	74	77	80
Crop	62	67	71	75	78	80	81
Impervious Areas	100	100	100	100	100	100	100

* Values taken from the NVCA SWM Guidelines (2013) and the City of Barrie SWM Guidelines (2020)

Post Development Initial Abstraction (IA):

Catchment	Total Area (m^2)	Lawn/Grass Area (m^2)	Forest/Woodlot Area (m^2)	Lakes / Wetlands SWMF (m^2)	Meadow/Field Area (m^2)	Crop Area (m^2)	Impervious Area (m^2)	Weighted IA
201	41,180	8,580		3,800			28,800	2.4
202	3,720	2,915					805	4.4

Initial Abstraction / Depression Storage	
Cover	**Depth (mm)**
Wetlands / Lakes/ SWMF	0
Forest/Woodlot	10
Meadow/Field	8
Lawn/Grass	5
Crop	7
Impervious Areas	2

* Values taken from the NVCA SWM Guidelines (2013)

For STANDHYD Command in Otthymo:

Pervious Area Calculations:	Catchment	Total Pervious Area (m2)				
	201	8,580				
Impervious Area Calulations:	**Catchment**	**Total Directly Connected Area (m2)**	**Total Indirectly Connected Area (m2)**	**Total Impervious Area (m2)**	**% Ximp**	**% Timp**
	201	23,283	9,317	32,600	56.5	79.2

BEAR CREEK RESIDENTIAL SUBDIVISION
Infiltration Basin Storage Volumes
City of Barrie

Project Number:	19-11476B
Date:	September 16, 2020
File:	Z:\Project Documents\11476B Bear Creek Village\PEL Functional Servicing Report - Rezoning\FSR\Pond Sizing Calculations - INF.xls

STAGE-STORAGE RELATIONSHIP - BASIN VOLUMES

Elevation	Depth	Basin Areas				Comments
		Area	Avg. Area	Basin Volume	Accum. Volume	
m	*m*	*m^2*	*m2*	*m^3*	*m^3*	*m*
238.10	0.00	2100.00	0.00	0.00	0.00	Bottom of Basin
238.20	0.10	2167.50	2133.75	213.38	213.38	Contour
238.30	0.20	2235.00	2201.25	220.13	433.50	Contour
238.40	0.30	2302.50	2268.75	226.88	660.38	Contour
238.50	0.40	2370.00	2336.25	233.63	894.00	Contour
238.60	0.50	2437.50	2403.75	240.38	1134.38	Contour
238.70	0.60	2505.00	2471.25	247.13	1381.50	Contour
238.80	0.70	2572.50	2538.75	253.88	1635.38	Contour
238.90	0.80	2640.00	2606.25	260.63	1896.00	Contour
239.00	0.90	2707.50	2673.75	267.38	2163.38	Contour
239.10	1.00	2775.00	2741.25	274.13	2437.50	Contour
239.20	1.10	2842.50	2808.75	280.88	2718.38	Contour
239.30	1.20	2910.00	2876.25	287.63	3006.00	Emergency Overflow Weir
239.40	1.30	2977.50	2943.75	294.38	3300.38	Contour
239.50	1.40	3045.00	3011.25	301.13	3601.50	Contour
239.60	1.50	3112.50	3078.75	307.88	3909.38	Contour
239.70	1.60	3180.00	3146.25	314.63	4224.00	Basin Top of Berm

BEAR CREEK RESIDENTIAL SUBDIVISION
INFILTRATION BASIN STAGE STORAGE DISCHARGE RELATIONSHIP
City of Barrie

Project Number:	19-11476B
Date:	September 16, 2020
File:	Z:\Project Documents\11476B Bear Creek Village\PEL Functional Servicing Report - Rezoning\FSR\Pond Sizing Calculations - INF.xls

Orifice Calculations

Q_o=C_d*A_o*(2*g*H_o)^0.5

	Orifice 1	Orifice 2	
C_d	0.63	0.63	
Invert (m)			
Width (m)			
Diameter/Height (m)			
Type (H/V)	V	V	

C	Description
0.63	Orifice Plate
0.8	Orifice Tube
1.837	Sharp Crested Weir
1.7	Broad Crested Weir

Weir Calculations

Q_w=C_w*(H_w)^1.5*((L-0.2*H_w)+(0.8*TAN(THETA)*H_w))

Cw	1.70
Invert (m)	239.3
Length (m)	5
Side Slope (H:V)	3
Side Slope (rad)	1.249

Stage Discharge Relationship for Basin:

Stage	Active Volume	Orifice 1			Orifice 2			Weir Flow	Total Flow	Comments
		Area	H_o	Flow	Area	H_o	Flow			
m	*m^3*	*m^2*	*m*	*m^3/s*	*m^2*	*m*	*m^3/s*	*m^3/s*	*m^3/s*	
238.10	0.00								0.0000	Bottom of Basin
238.20	213.38								0.0000	Contour
238.30	433.50								0.0000	Contour
238.40	660.38								0.0000	Contour
238.50	894.00								0.0000	Contour
238.60	1134.38								0.0000	Contour
238.70	1381.50								0.0000	Contour
238.80	1635.38								0.0000	Contour
238.90	1896.00								0.0000	Contour
239.00	2163.38								0.0000	Contour
239.10	2437.50								0.0000	Contour
239.20	2718.38								0.0000	Contour
239.30	3006.00							0.0000	0.0000	Emergency Overflow Weir
239.40	3300.38							0.2806	0.2806	Contour
239.50	3601.50							0.8272	0.8272	Contour
239.60	3909.38							1.5811	1.5811	Contour
239.70	4224.00							2.5288	2.5288	Basin Top of Berm

```
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO      TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\0c5a
030f-b111-4b26-84da-37586d2e6074\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\0c5a
030f-b111-4b26-84da-37586d2e6074\scen


DATE: 09-15-2020                           TIME: 09:55:42

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : A - 2Y24H                     **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
```

```
      --------------------
    READ STORM                 15.0
    [ Ptot= 55.00 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\3ba61992-6
7a7-4257-b277-15d
    remark: 2Y24H

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.02 12.50   2.51 0.05   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\ca24
03b0-a5c2-4bb9-aab5-56446f888bbc\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\ca24
03b0-a5c2-4bb9-aab5-56446f888bbc\scen


DATE: 09-15-2020                           TIME: 09:55:42

USER:
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COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : B - 5Y24H                   **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot= 76.01 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\43c00f0a-f
71d-4d8a-b94b-0ed
    remark: 5Y24H

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.04 12.50   5.26 0.07   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****
```

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
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0299-f82d-4536-9b9d-ba296992023f\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\32b7
0299-f82d-4536-9b9d-ba296992023f\scen


DATE: 09-15-2020                           TIME: 09:55:42

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : C - 10Y24H                    **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                 min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot= 89.94 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\aa84db15-2
2ea-484f-87ec-9b1
    remark: 10Y24H

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.05 12.50   7.59 0.08   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
```

```
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M  OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\1dd3
a119-8595-45bb-8463-b2f8735d8e60\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\1dd3
a119-8595-45bb-8463-b2f8735d8e60\scen


DATE: 09-15-2020                           TIME: 09:55:42

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : D - 25Y24H                    **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha    '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot=107.47 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\e267e837-e
991-4454-96a4-531
    remark: 25Y24H
```

```
*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.08 12.50  11.05 0.10   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO     TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\d397
00b0-53f6-4c75-8711-44df8348ddd2\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\d397
00b0-53f6-4c75-8711-44df8348ddd2\scen


DATE: 09-15-2020                           TIME: 09:55:42

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : E - 50Y24H                    **
  ************************************************
```

```
  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha    '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot=120.63 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\efdf2c06-1
033-4963-a099-dbf
    remark: 50Y24H

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.10 12.50  14.02 0.12   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M  OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M  OOO
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  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\b6c7
e0f6-06e2-4634-8aa1-9a740307a351\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\b6c7
e0f6-06e2-4634-8aa1-9a740307a351\scen
```

```
DATE: 09-15-2020                           TIME: 09:55:42

USER:


COMMENTS: ____________________________________________________________


  **************************************************
  ** SIMULATION : F - 100Y24H                    **
  **************************************************

  W/E COMMAND              HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                   min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot=133.60 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\929826b8-b
96c-4736-8554-b2b
    remark: 100Y24H

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.12 12.50  17.25 0.13   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
==================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\f1cf
d94b-0ffc-42fa-9441-443190bd2a30\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\f1cf
d94b-0ffc-42fa-9441-443190bd2a30\scen


DATE: 09-15-2020                           TIME: 09:55:42

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : G - CHI2YR                    **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                10.0
    [ Ptot= 36.95 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\c974dde9-2
189-495d-84cd-4e4
    remark: CHI2YR

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.01  1.83   0.92 0.02   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================
```

```
       V    V   I    SSSSS  U   U    A    L             (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\860b
dd37-689a-4ff8-a27e-060e0569aec4\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\860b
dd37-689a-4ff8-a27e-060e0569aec4\scen


DATE: 09-15-2020                           TIME: 09:55:42

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : H - CHI5YR                    **
  ************************************************


  W/E COMMAND            HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                10.0
```

```
    [ Ptot= 50.52 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\f1aee694-1
f67-4c7c-af8d-20d
    remark: CHI5YR

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.02  1.83   2.05 0.04   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\25c4
5169-e7e9-4d83-b3a4-dc40fd8a5ff9\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\25c4
5169-e7e9-4d83-b3a4-dc40fd8a5ff9\scen


DATE: 09-15-2020                           TIME: 09:55:42

USER:


COMMENTS: ____________________________________________________________
```

```
  ************************************************
  ** SIMULATION : I - CHI10YR                   **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm           cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 59.69 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\05f7220d-c
7fb-4a10-b3bf-ffe
    remark: CHI10YR

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.02  1.75   3.04 0.05   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat
```

```
  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\37ca
7534-18a5-492c-8df1-951d5aad260d\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\37ca
7534-18a5-492c-8df1-951d5aad260d\scen


DATE: 09-15-2020                           TIME: 09:55:42

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : J - CHI25YR                    **
  ************************************************

  W/E COMMAND            HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                 min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM               10.0
    [ Ptot= 71.24 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\a57c12f0-0
885-4654-893b-115
    remark: CHI25YR

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.04  1.75   4.55 0.06   0.000
55.00   0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL
```

```
        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\e019
5f71-1553-43c9-8f31-a7a5762a421a\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\e019
5f71-1553-43c9-8f31-a7a5762a421a\scen


DATE: 09-15-2020                           TIME: 09:55:42

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COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : K - CHI50YR                   **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm           cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 79.45 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\25fb77fd-7
eae-4a37-a125-1b9
    remark: CHI50YR

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.05  1.75   5.80 0.07   0.000
```

```
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================


       V    V   I   SSSSS  U   U    A    L             (v 6.1.2003)
       V    V   I   SS     U   U   A A   L
        V  V    I    SS    U   U  AAAAA  L
        V  V    I     SS   U   U  A   A  L
         VV     I   SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO     TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\56a1
6755-2fbe-4721-9659-105e1d473389\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\56a1
6755-2fbe-4721-9659-105e1d473389\scen


DATE: 09-15-2020                           TIME: 09:55:42

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : L - CHI100YR                  **
  ************************************************


  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
```

```
                                  min     ha   '  cms   hrs     mm         cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 87.58 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\dcb4d143-7
95a-4319-bfff-b1e
    remark: CHI100YR

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.06  1.75   7.17 0.08   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\59aa
969d-05e1-4d6c-a1b4-2ac3ca2f3919\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\9d27a120-e62e-4689-ac02-4ed96fd7c81d\59aa
969d-05e1-4d6c-a1b4-2ac3ca2f3919\scen
```

```
DATE: 09-15-2020                           TIME: 09:55:42

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  ************************************************
  ** SIMULATION : M - TIMMINS                   **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\552ac51f-2639-49d9-b62a-6bf99bfbb6d1\6ef9ea1d-2
995-443d-bbb5-0ff
    remark: TIMMINS

*
 ** CALIB NASHYD         0001  1  5.0    4.49    0.10  7.08  35.43 0.18   0.000
55.00    0.23
    [CN=25.0         ]
    [ N = 3.0:Tp 0.35]
*
 FINISH

===================================================================================
========================
```

```
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\54d9
c661-8ca9-4e77-8e17-706e36738739\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\54d9
c661-8ca9-4e77-8e17-706e36738739\scen


DATE: 09-16-2020                           TIME: 10:14:51

USER:


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  ************************************************
  ** SIMULATION : A - 2Y24H                     **
  ************************************************

  W/E COMMAND            HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
```

```
      --------------------
    READ STORM                 15.0
    [ Ptot= 55.00 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\a571e396-3
6b2-4555-b33f-341
    remark: 2Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.01 12.28   7.06 0.13   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot= 55.00 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\a571e396-3
6b2-4555-b33f-341
    remark: 2Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.43 12.25  35.62 0.65   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    0.44 12.25  33.41  n/a   0.000
66.41    0.21
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****
```

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\5712
681b-3963-4a0c-9209-5f728920a650\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\5712
681b-3963-4a0c-9209-5f728920a650\scen


DATE: 09-16-2020                           TIME: 10:14:51

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : B - 5Y24H                     **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot= 76.01 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\ba028300-f
2c6-4475-be72-b7d
    remark: 5Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.02 12.28  13.35 0.18   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot= 76.01 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\ba028300-f
2c6-4475-be72-b7d
    remark: 5Y24H
```

```
*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.62 12.25  51.86 0.68   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    0.64 12.25  48.96  n/a   0.000
66.50    0.21
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\6daf
d2b9-838c-4b77-ab5d-bce7f28a09b7\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\6daf
d2b9-838c-4b77-ab5d-bce7f28a09b7\scen


DATE: 09-16-2020                           TIME: 10:14:51

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : C - 10Y24H                    **
```

```
  ************************************************

  W/E COMMAND             HYD ID    DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min      ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot= 89.94 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\04987249-3
b64-4f6b-83ea-de1
    remark: 10Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.03 12.28  18.33 0.20   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot= 89.94 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\04987249-3
b64-4f6b-83ea-de1
    remark: 10Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.76 12.25  63.07 0.70   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    0.79 12.25  59.75  n/a   0.000
66.55    0.21
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M  OOO    TM
       O   O    T      T    H   H   Y Y   MM MM O   O
       O   O    T      T    H   H    Y    M   M O   O
```

```
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\1679
8603-176d-4a90-8e80-043b9f9ebea5\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\1679
8603-176d-4a90-8e80-043b9f9ebea5\scen


DATE: 09-16-2020                           TIME: 10:14:51

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : D - 25Y24H                    **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot=107.47 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\752adc2c-2
755-497c-850a-ee4
    remark: 25Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.04 12.28  25.40 0.24   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
```

```
*
    READ STORM                 15.0
    [ Ptot=107.47 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\752adc2c-2
755-497c-850a-ee4
    remark: 25Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.95 12.25  77.57 0.72   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    0.98 12.25  73.77  n/a   0.000
66.62    0.21
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M  OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\4f0a
34dd-664c-485c-ac46-f72461a9ee97\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\4f0a
34dd-664c-485c-ac46-f72461a9ee97\scen


DATE: 09-16-2020                           TIME: 10:14:51
```

```
USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : E - 50Y24H                   **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot=120.63 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\3aeebfac-6
211-481c-affa-3fb
    remark: 50Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.04 12.28  31.21 0.26   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot=120.63 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\3aeebfac-6
211-481c-affa-3fb
    remark: 50Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    1.09 12.25  88.70 0.74   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    1.13 12.25  84.56  n/a   0.000
66.66    0.21
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
```

```
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\db46
4776-7c81-4e39-9b0f-eeda39a20928\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\db46
4776-7c81-4e39-9b0f-eeda39a20928\scen


DATE: 09-16-2020                           TIME: 10:14:51

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : F - 100Y24H                   **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot=133.60 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\0e3ba1af-2
```

```
ee8-4728-9bd8-c97
    remark: 100Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.05 12.28  37.34 0.28   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot=133.60 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\0e3ba1af-2
ee8-4728-9bd8-c97
    remark: 100Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    1.23 12.25  99.85 0.75   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    1.28 12.25  95.40  n/a   0.000
66.70    0.21
*
==================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\ef1f
```

```
8e64-0ff1-4da4-9781-963f5dfafe4d\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\ef1f
8e64-0ff1-4da4-9781-963f5dfafe4d\scen


DATE: 09-16-2020                          TIME: 10:14:51

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : G - CHI2YR                    **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM               10.0
    [ Ptot= 36.95 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\b3d29d3e-4
409-42e4-8b0f-253
    remark: CHI2YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.01  1.43   4.00 0.11   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM               10.0
    [ Ptot= 36.95 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\b3d29d3e-4
409-42e4-8b0f-253
    remark: CHI2YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.50  1.35  22.45 0.61   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
```

```
    ADD [  0001+  0002]  0003  3  1.0    4.49    0.51  1.35  20.92  n/a   0.000
66.68    0.21
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\be63
9b69-f099-4c98-a388-6587e152c025\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\be63
9b69-f099-4c98-a388-6587e152c025\scen


DATE: 09-16-2020                           TIME: 10:14:51

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : H - CHI5YR                    **
  ************************************************


  W/E COMMAND              HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                   min     ha   '  cms   hrs     mm          cms
```

```
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 50.52 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\970669dc-d
8c9-4960-a253-516
    remark: CHI5YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.01  1.43   7.63 0.15   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 10.0
    [ Ptot= 50.52 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\970669dc-d
8c9-4960-a253-516
    remark: CHI5YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.69  1.35  32.27 0.64   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    0.70  1.35  30.23  n/a   0.000
66.84    0.21
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

```
                    *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\08d8
d847-5b1c-4757-9094-9202eb71bf12\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\08d8
d847-5b1c-4757-9094-9202eb71bf12\scen


DATE: 09-16-2020                           TIME: 10:14:50

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : I - CHI10YR                   **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 59.69 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\fc714908-7
2cc-4142-ada8-a45
    remark: CHI10YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.01  1.42  10.62 0.18   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 10.0
    [ Ptot= 59.69 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\fc714908-7
```

```
2cc-4142-ada8-a45
    remark: CHI10YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.82  1.35  39.16 0.66   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    0.83  1.35  36.80  n/a   0.000
66.94    0.21
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\caf8
c5e3-8e9f-4989-a002-0cd7424d784b\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\caf8
c5e3-8e9f-4989-a002-0cd7424d784b\scen


DATE: 09-16-2020                           TIME: 10:14:51

USER:


COMMENTS: ____________________________________________________________
```

```
  **********************************************
  ** SIMULATION : J  - CHI25YR                 **
  **********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                 min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 71.24 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\04ce8b59-9
a85-4cd6-a487-6a8
    remark: CHI25YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.02  1.42  14.92 0.21   0.000
97.82   0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 10.0
    [ Ptot= 71.24 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\04ce8b59-9
a85-4cd6-a487-6a8
    remark: CHI25YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.99  1.35  48.09 0.68   0.000
66.18   0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    1.00  1.35  45.35  n/a   0.000
67.04   0.21
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL
```

```
         OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
        O   O    T      T    H   H   Y Y   MM MM  O   O
        O   O    T      T    H   H    Y    M   M  O   O
         OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\81a5
b3ee-1905-45d6-8324-52c2227d19b9\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\81a5
b3ee-1905-45d6-8324-52c2227d19b9\scen


DATE: 09-16-2020                           TIME: 10:14:51

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : K - CHI50YR                    **
  ************************************************

  W/E COMMAND              HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                   min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                  10.0
    [ Ptot= 79.45 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\0ac53be3-0
3b6-40bb-b952-9f1
    remark: CHI50YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.02  1.42  18.31 0.23   0.000
```

```
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 10.0
    [ Ptot= 79.45 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\0ac53be3-0
3b6-40bb-b952-9f1
    remark: CHI50YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    1.12  1.35  54.60 0.69   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    1.14  1.35  51.60  n/a   0.000
67.11    0.21
*
====================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\59cf
e8ef-d5e4-4825-be2d-88a236c5ca1f\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\59cf
e8ef-d5e4-4825-be2d-88a236c5ca1f\scen
```

```
DATE: 09-16-2020                           TIME: 10:14:50

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : L - CHI100YR                  **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 87.58 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\c005e65d-e
7a5-4b3d-904a-a1f
    remark: CHI100YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.03  1.42  21.91 0.25   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 10.0
    [ Ptot= 87.58 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\c005e65d-e
7a5-4b3d-904a-a1f
    remark: CHI100YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    1.25  1.35  61.15 0.70   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    1.27  1.35  57.90  n/a   0.000
67.17    0.21
*
==================================================================================
========================
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\6335
39a2-81e7-427f-9b62-acb5df44f0e6\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\6335
39a2-81e7-427f-9b62-acb5df44f0e6\scen


DATE: 09-16-2020                           TIME: 10:14:51

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : M - TIMMINS                   **
  ************************************************

  W/E COMMAND            HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
```

```
    [ Ptot=193.00 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\4ecb83b1-b
634-4acd-b751-1ea
    remark: TIMMINS

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.02  7.00  84.45 0.44   0.000
97.82    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\41bfd939-8833-4ea3-afa3-adbc1f3cad47\4ecb83b1-b
634-4acd-b751-1ea
    remark: TIMMINS

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.41  7.00 152.60 0.79   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
    ADD [  0001+  0002]  0003  3  1.0    4.49    0.43  7.00 146.96  n/a   0.000
67.69    0.22
*
 FINISH

===================================================================================
========================
```

```
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\54d9
c661-8ca9-4e77-8e17-706e36738739\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\54d9
c661-8ca9-4e77-8e17-706e36738739\scen


DATE: 09-16-2020                           TIME: 10:28:10

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : A- 2Y24H                      **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
```

```
      --------------------
    READ STORM                 15.0
    [ Ptot= 55.00 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\a571e396-3
6b2-4555-b33f-341
    remark: 2Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.01 12.28   7.06 0.13   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot= 55.00 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\a571e396-3
6b2-4555-b33f-341
    remark: 2Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.43 12.25  35.62 0.65   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.00  0.00   0.00  n/a   0.000
0.00    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.01 12.28   0.75  n/a   0.000
76.43    0.23
*
==================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

```
                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\5712
681b-3963-4a0c-9209-5f728920a650\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\5712
681b-3963-4a0c-9209-5f728920a650\scen


DATE: 09-16-2020                           TIME: 10:28:10

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : B - 5Y24H                     **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot= 76.01 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\ba028300-f
2c6-4475-be72-b7d
    remark: 5Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.02 12.28  13.35 0.18   0.000
97.84    0.30
    [CN=52.2        ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot= 76.01 mm ]
    fname :
```

```
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\ba028300-f
2c6-4475-be72-b7d
    remark: 5Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.62 12.25  51.86 0.68   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.00  0.00   0.00  n/a   0.000
0.00    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.02 12.28   1.40  n/a   0.000
77.47    0.24
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\6daf
d2b9-838c-4b77-ab5d-bce7f28a09b7\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\6daf
d2b9-838c-4b77-ab5d-bce7f28a09b7\scen


DATE: 09-16-2020                           TIME: 10:28:10
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USER:

COMMENTS: ____

```
  ************************************************
  ** SIMULATION : C - 10Y24H                    **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot= 89.94 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\04987249-3
b64-4f6b-83ea-de1
    remark: 10Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.03 12.28  18.33 0.20   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot= 89.94 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\04987249-3
b64-4f6b-83ea-de1
    remark: 10Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.76 12.25  63.07 0.70   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.00  0.00   0.00  n/a   0.000
0.00    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.03 12.28   1.91  n/a   0.000
77.96    0.24
*
===================================================================================
```

```
========================


       V    V   I   SSSSS  U   U    A    L             (v 6.1.2003)
       V    V   I   SS     U   U   A A   L
        V  V    I    SS    U   U  AAAAA  L
        V  V    I     SS   U   U  A   A  L
         VV     I   SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\1679
8603-176d-4a90-8e80-043b9f9ebea5\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\1679
8603-176d-4a90-8e80-043b9f9ebea5\scen


DATE: 09-16-2020                           TIME: 10:28:09

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : D - 25Y24H                    **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
```

```
    READ STORM                 15.0
    [ Ptot=107.47 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\752adc2c-2
755-497c-850a-ee4
    remark: 25Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.04 12.28  25.40 0.24   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot=107.47 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\752adc2c-2
755-497c-850a-ee4
    remark: 25Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.95 12.25  77.57 0.72   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.01 24.25   4.57  n/a   0.000
11.91    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.04 12.28   6.82  n/a   0.000
37.54    0.09
*
====================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

```
                    *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\4f0a
34dd-664c-485c-ac46-f72461a9ee97\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\4f0a
34dd-664c-485c-ac46-f72461a9ee97\scen


DATE: 09-16-2020                           TIME: 10:28:09

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : E - 50Y24H                    **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot=120.63 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\3aeebfac-6
211-481c-affa-3fb
    remark: 50Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.04 12.28  31.21 0.26   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot=120.63 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\3aeebfac-6
```

```
211-481c-affa-3fb
    remark: 50Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    1.09 12.25  88.70 0.74   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.03 16.28  15.70  n/a   0.000
11.91    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.04 12.28  17.61  n/a   0.000
24.11    0.04
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\db46
4776-7c81-4e39-9b0f-eeda39a20928\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\db46
4776-7c81-4e39-9b0f-eeda39a20928\scen


DATE: 09-16-2020                           TIME: 10:28:10

USER:
```

COMMENTS: ____

```
  ************************************************
  ** SIMULATION : F - 100Y24H                   **
  ************************************************

  W/E COMMAND              HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot=133.60 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\0e3ba1af-2
ee8-4728-9bd8-c97
    remark: 100Y24H

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.05 12.28  37.34 0.28   0.000
97.84    0.30
    [CN=52.2          ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot=133.60 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\0e3ba1af-2
ee8-4728-9bd8-c97
    remark: 100Y24H

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    1.23 12.25  99.85 0.75   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.08 14.32  26.85  n/a   0.000
11.91    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.09 14.32  28.45  n/a   0.000
20.95    0.03
*
==================================================================================
========================
```

```
       V    V   I   SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I   SS     U   U   A A   L
        V  V    I    SS    U   U  AAAAA  L
        V  V    I     SS   U   U  A   A  L
         VV     I   SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\ef1f
8e64-0ff1-4da4-9781-963f5dfafe4d\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\ef1f
8e64-0ff1-4da4-9781-963f5dfafe4d\scen


DATE: 09-16-2020                          TIME: 10:28:09

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : G - CHI2YR                    **
  ************************************************

  W/E COMMAND            HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                 min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                10.0
```

```
    [ Ptot= 36.95 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\b3d29d3e-4
409-42e4-8b0f-253
    remark: CHI2YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.01  1.43   4.00 0.11   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                10.0
    [ Ptot= 36.95 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\b3d29d3e-4
409-42e4-8b0f-253
    remark: CHI2YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.50  1.35  22.45 0.61   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.00  0.00   0.00  n/a   0.000
0.00    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.01  1.43   0.33  n/a   0.000
97.84    0.30
*
==================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO     TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

```
                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\be63
9b69-f099-4c98-a388-6587e152c025\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\be63
9b69-f099-4c98-a388-6587e152c025\scen


DATE: 09-16-2020                           TIME: 10:28:09

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : H - CHI5YR                    **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha    '  cms   hrs     mm           cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 50.52 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\970669dc-d
8c9-4960-a253-516
    remark: CHI5YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.01  1.43   7.63 0.15   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 10.0
    [ Ptot= 50.52 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\970669dc-d
8c9-4960-a253-516
```

```
    remark: CHI5YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.69  1.35  32.27 0.64   0.000
66.18   0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.00  0.00   0.00  n/a   0.000
0.00    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.01  1.43   0.63  n/a   0.000
97.84    0.30
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\08d8
d847-5b1c-4757-9094-9202eb71bf12\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\08d8
d847-5b1c-4757-9094-9202eb71bf12\scen


DATE: 09-16-2020                           TIME: 10:28:09

USER:
```

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COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : I - CHI10YR                   **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 59.69 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\fc714908-7
2cc-4142-ada8-a45
    remark: CHI10YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.01  1.42  10.62 0.18   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 10.0
    [ Ptot= 59.69 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\fc714908-7
2cc-4142-ada8-a45
    remark: CHI10YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.82  1.35  39.16 0.66   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.00  0.00   0.00  n/a   0.000
0.00    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.01  1.42   0.88  n/a   0.000
97.84    0.30
*
==================================================================================
========================
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\caf8
c5e3-8e9f-4989-a002-0cd7424d784b\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\caf8
c5e3-8e9f-4989-a002-0cd7424d784b\scen


DATE: 09-16-2020                           TIME: 10:28:09

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : J - CHI25YR                   **
  ************************************************


  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 71.24 mm ]
```

```
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\04ce8b59-9
a85-4cd6-a487-6a8
    remark: CHI25YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.02  1.42  14.92 0.21   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 10.0
    [ Ptot= 71.24 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\04ce8b59-9
a85-4cd6-a487-6a8
    remark: CHI25YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.99  1.35  48.09 0.68   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.00  0.00   0.00  n/a   0.000
0.00    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.02  1.42   1.24  n/a   0.000
97.84    0.30
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M  OOO     TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****
```

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\81a5
b3ee-1905-45d6-8324-52c2227d19b9\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\81a5
b3ee-1905-45d6-8324-52c2227d19b9\scen


DATE: 09-16-2020                           TIME: 10:28:09

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : K - CHI50YR                   **
  ************************************************

  W/E COMMAND              HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                   min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 79.45 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\0ac53be3-0
3b6-40bb-b952-9f1
    remark: CHI50YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.02  1.42  18.31 0.23   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 10.0
    [ Ptot= 79.45 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\0ac53be3-0
3b6-40bb-b952-9f1
    remark: CHI50YR
```

```
*
 ** CALIB STANDHYD       0001  1  1.0    4.12    1.12  1.35  54.60 0.69   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.00  0.00   0.00  n/a   0.000
0.00    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.02  1.42   1.52  n/a   0.000
97.84    0.30
*
===================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\59cf
e8ef-d5e4-4825-be2d-88a236c5ca1f\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\59cf
e8ef-d5e4-4825-be2d-88a236c5ca1f\scen


DATE: 09-16-2020                           TIME: 10:28:09

USER:
```

COMMENTS: ____

```
  **********************************************
  ** SIMULATION : L - CHI100YR                **
  **********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 10.0
    [ Ptot= 87.58 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\c005e65d-e
7a5-4b3d-904a-a1f
    remark: CHI100YR

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.03  1.42  21.91 0.25   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 10.0
    [ Ptot= 87.58 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\c005e65d-e
7a5-4b3d-904a-a1f
    remark: CHI100YR

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    1.25  1.35  61.15 0.70   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.00  0.00   0.00  n/a   0.000
0.00    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.03  1.42   1.82  n/a   0.000
97.84    0.30
*
==================================================================================
=======================
```

```
       V    V   I    SSSSS  U   U    A    L            (v 6.1.2003)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\6335
39a2-81e7-427f-9b62-acb5df44f0e6\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\89c89c50-1287-44d2-b8ac-2ad6524a4294\6335
39a2-81e7-427f-9b62-acb5df44f0e6\scen


DATE: 09-16-2020                           TIME: 10:28:10

USER:


COMMENTS: ____________________________________________________________


  ************************************************
  ** SIMULATION : M - TIMMINS                   **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
TSS CONC TP CONC
                                  min     ha   '  cms   hrs     mm          cms
mg/l   mg/l

      START @  0.00 hrs
      --------------------
    READ STORM                 15.0
    [ Ptot=193.00 mm ]
    fname :
```

```
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\4ecb83b1-b
634-4acd-b751-1ea
    remark: TIMMINS

*
 ** CALIB NASHYD         0002  1  1.0    0.37    0.02  7.00  84.45 0.44   0.000
97.84    0.30
    [CN=52.2         ]
    [ N = 3.0:Tp 0.12]
*
    READ STORM                 15.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\dhordyk\AppData\Local\Temp\aa083ea5-fa1e-451d-933f-ce81622e6f7d\4ecb83b1-b
634-4acd-b751-1ea
    remark: TIMMINS

*
 ** CALIB STANDHYD       0001  1  1.0    4.12    0.41  7.00 152.60 0.79   0.000
66.18    0.21
    [I%=56.5:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0003  1  1.0    4.12    0.24  7.27  79.60  n/a   0.000
11.91    0.00
*
    ADD [  0002+  0003]  0004  3  1.0    4.49    0.26  7.23  80.00  n/a   0.000
19.43    0.03
*
 FINISH

==================================================================================
========================
```

BEAR CREEK RESIDENTIAL DEVELOPMENT
City of Barrie

Project Number:	19-11476B
Date:	August 24, 2020
Design By:	DPH
Checked By:	JHV
File:	Z:\Project Documents\11476B Bear Creek Village\PEL Functional Servicing Report - Rezoning\FSR\Design Sheets\Storm Sewer Design Sheet - DH.xls

STORM SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Drainage Area Plan No: See Drawing STM-1

Design Parameters

5 YEAR STORM

Q=kAIR, k=0.00278
Intensity (I) = a/(tc+b)^c
a = 853.608
b = 4.699
c = 0.766

Manning's "n" 0.013
Min. Velocity 0.750 m/s
Max. Velocity 4.000 m/s

PINESTONE ENGINEERING LTD.

LOCATION				STORMWATER FLOW 5 YEAR STORM								DESIGN					
STREET	AREA NUMBER	MANHOLE LOCATION		AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME		RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
		FROM MH	TO MH					TOTAL	IN PIPE								
				ha		*ha*	*ha*	*min*	*min*	*mm/hr*	*L/s*	*mm*	*m*	*%*	*L/s*	*m/s*	*m/s*
NORTH OUTLET																	
Catchment 301	301	CB#1	CB#2/CBMH#1	0.05	0.78	0.0413	0.0413	10.0000	0.6809	108.92211	12.47287	250	25.3	0.30	32.57171	0.6635	0.6193
Catchment 302	302	CBMH#1	STMMH#1	0.61	0.69	0.4209	0.4622	10.6809	0.7424	105.20902	134.71014	450	49.2	0.30	156.15906	0.9819	1.1045
		STMMH#1	CBMH#2				0.4622	11.4233	0.5205	101.47755	129.93234	450	34.3	0.30	156.15906	0.9819	1.0983
Catchment 303	303	CBMH#2	STMMH#2	0.52	0.54	0.2797	0.7420	11.9438	0.8018	99.03739	203.54454	525	58.9	0.30	235.55481	1.0881	1.2244
Catchment 304	304	CB#5	CBMH#3	0.17	0.85	0.1411	0.1411	10.0000	0.3621	108.92211	42.57188	300	33.4	1.50	118.43376	1.6755	1.5375
Catchment 305	305	CBMH#3	STMMH#2	0.18	0.82	0.1451	0.2862	10.3621	0.0732	106.91065	84.76783	300	8.0	1.50	118.43376	1.6755	1.8213
Catchment 306	306	STMMH#2	DCBMH#1	0.06	0.90	0.0520	1.0802	10.4353	0.4666	106.51429	318.71307	575	42.4	0.40	346.67095	1.3350	1.5144
Catchment 307	307	CB#8	CBMH#5	0.23	0.82	0.1911	0.1911	10.0000	0.8979	108.92211	57.64552	375	41.8	0.20	78.41002	0.7099	0.7759
Catchment 308	308	RYCB#1	CBMH#5	0.05	0.30	0.0159	0.0159	10.0000	0.6036	108.92211	4.79726	150	26.6	0.90	14.44789	0.8176	0.7345
Catchment 309	309	CBMH#5	STMMH#3	0.14	0.85	0.1216	0.3285	10.8979	1.3496	104.08575	94.71519	450	71.1	0.20	127.50334	0.8017	0.8780
Catchment 310	310	RYCB#2	CBMH#6	0.03	0.40	0.0120	0.0120	10.0000	0.3140	108.92211	3.62057	150	20.8	3.50	28.49163	1.6123	1.1042
Catchment 311	311	CB#13	STMMH#3	0.04	0.62	0.0267	0.0387	10.3140	0.1493	107.17302	11.47697	300	12.8	3.50	180.91055	2.5594	1.4294
Catchment 312	312	RYCB#3	STMMH#3	0.03	0.42	0.0122	0.0122	10.0000	0.5721	108.92211	3.67488	150	32.8	2.30	23.09655	1.3070	0.9555
Catchment 313	313	CB#11	STMMH#3	0.33	0.76	0.2516	0.2637	10.5721	0.7682	105.78233	77.28032	300	72.8	1.10	101.42061	1.4348	1.5794
		STMMH#3	CBMH#6				0.6309	10.4632	0.1541	106.36397	185.88388	450	13.3	0.50	201.60049	1.2676	1.4383
Catchment 314	314	CBMH#6	STMMH#4	0.25	0.78	0.1934	0.8244	10.6173	0.2925	105.54319	241.00255	525	24.9	0.40	271.99526	1.2565	1.4188
Catchment 315	315	CB#16	CB#18	0.36	0.85	0.3035	0.3035	10.0000	0.7739	108.92211	91.55518	375	71.6	0.90	166.33278	1.5060	1.5419
Catchment 316	316	CB#18	STMMH#4	0.27	0.82	0.2206	0.5240	10.7739	0.2343	104.72388	152.01333	375	24.0	0.90	166.33278	1.5060	1.7074
		STMMH#4	DCBMH#1				1.3484	11.5479	0.4241	100.88086	376.79130	600	44.0	0.50	434.17173	1.5356	1.7290
Catchment 317	317	DCBMH#1	WETLAND	0.28	0.72	0.2009	2.6295	10.9019	0.0606	104.06528	757.97611	750	8.0	0.60	862.34066	1.9519	2.2019

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/03/2020

Province:	Ontario
City:	Barrie
Nearest Rainfall Station:	BARRIE WPCC
NCDC Rainfall Station Id:	0557
Years of Rainfall Data:	36

Site Name:	Bear Creek

Drainage Area (ha):	3.738
% Imperviousness:	77.00

Runoff Coefficient 'c': 0.76

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	98.62
Oil / Fuel Spill Risk Site?	No
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Bear Creek Residential Development
Project Number:	19-11476B
Designer Name:	Dwight Hordyk
Designer Company:	Pinestone Engineering Limited
Designer Email:	dhordyk@pel.ca
Designer Phone:	705-646-3143
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	48
EF6	63
EF8	72
EF10	78
EF12	82

Recommended Stormceptor EF Model: EF12

Estimated Net Annual Sediment (TSS) Load Reduction (%): 82

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

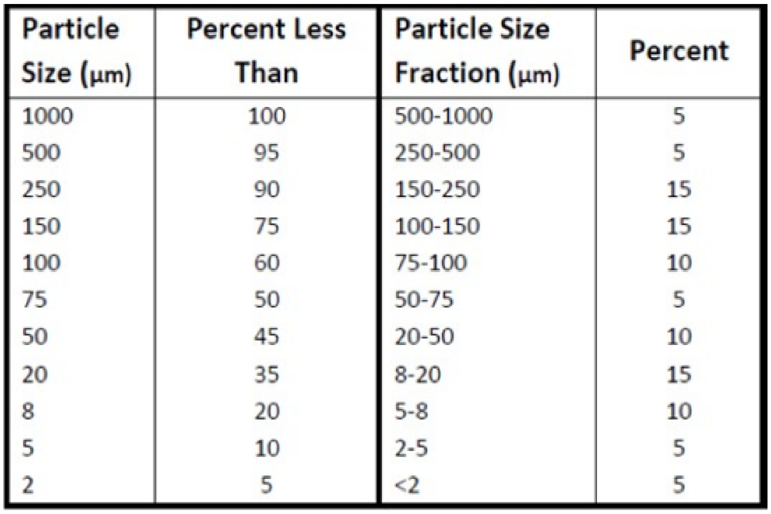
►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian 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.

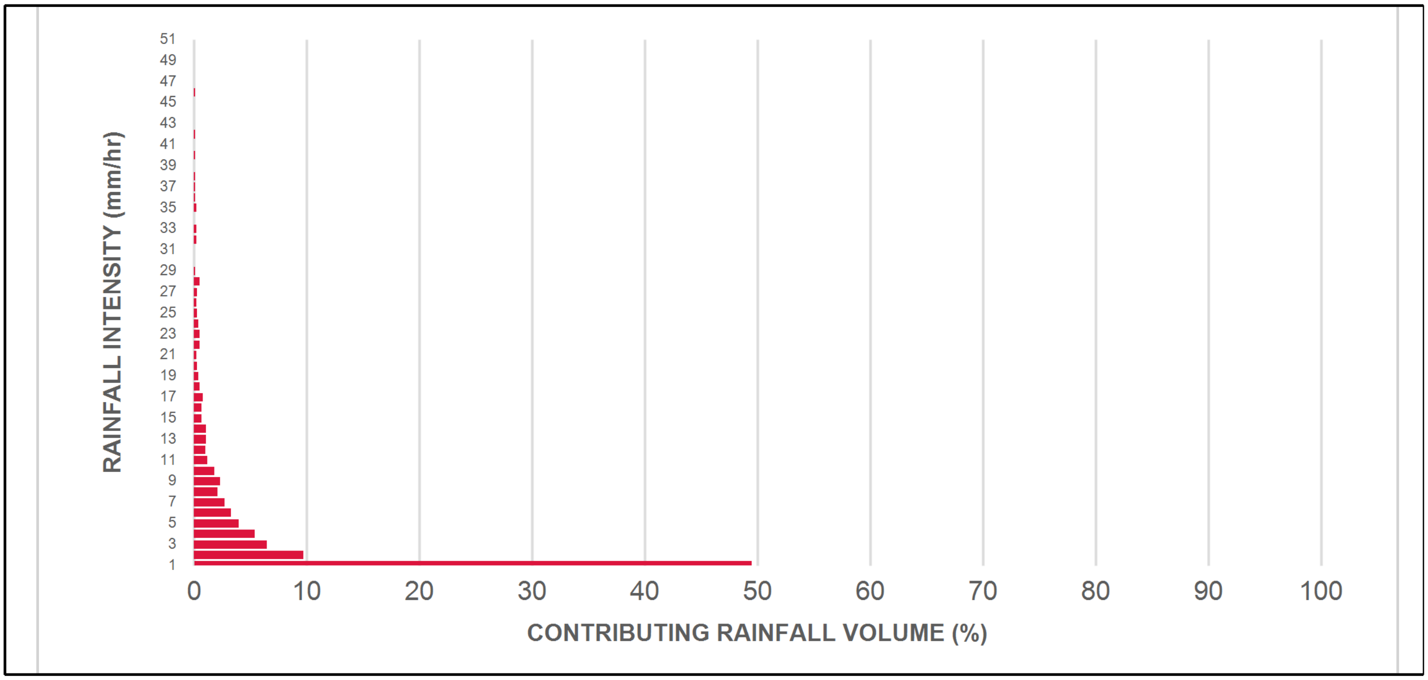


Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

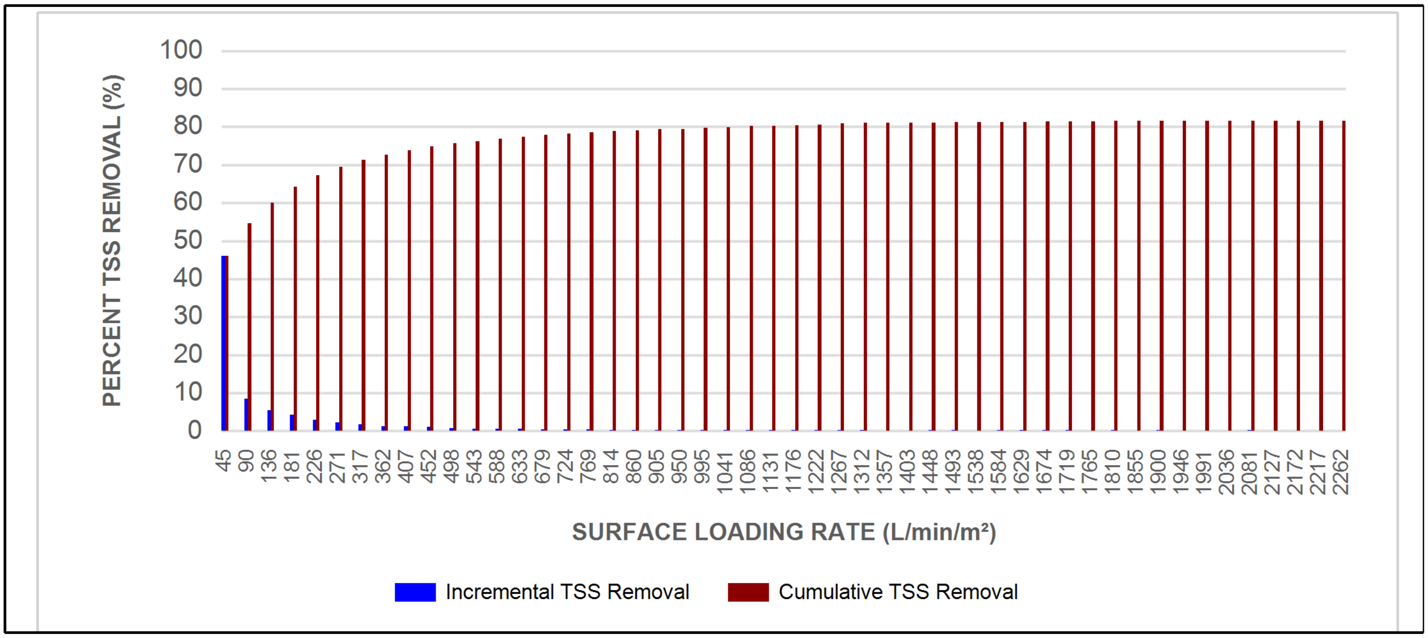
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	49.5	49.5	7.92	475.0	45.0	93	46.0	46.0
2	9.7	59.2	15.84	950.0	90.0	88	8.5	54.6
3	6.5	65.7	23.76	1425.0	136.0	84	5.4	60.0
4	5.4	71.1	31.67	1900.0	181.0	78	4.2	64.2
5	4.0	75.1	39.59	2376.0	226.0	74	3.0	67.2
6	3.3	78.4	47.51	2851.0	271.0	70	2.3	69.5
7	2.7	81.1	55.43	3326.0	317.0	66	1.8	71.3
8	2.1	83.2	63.35	3801.0	362.0	62	1.3	72.6
9	2.3	85.5	71.27	4276.0	407.0	58	1.3	73.9
10	1.8	87.3	79.18	4751.0	452.0	58	1.0	74.9
11	1.2	88.5	87.10	5226.0	498.0	57	0.7	75.6
12	1.0	89.5	95.02	5701.0	543.0	57	0.6	76.2
13	1.1	90.6	102.94	6176.0	588.0	56	0.6	76.8
14	1.1	91.7	110.86	6651.0	633.0	56	0.6	77.4
15	0.7	92.4	118.78	7127.0	679.0	56	0.4	77.8
16	0.7	93.1	126.69	7602.0	724.0	55	0.4	78.2
17	0.8	93.9	134.61	8077.0	769.0	55	0.4	78.6
18	0.5	94.4	142.53	8552.0	814.0	55	0.3	78.9
19	0.4	94.8	150.45	9027.0	860.0	55	0.2	79.1
20	0.3	95.1	158.37	9502.0	905.0	55	0.2	79.3
21	0.2	95.3	166.29	9977.0	950.0	54	0.1	79.4
22	0.5	95.8	174.21	10452.0	995.0	54	0.3	79.7
23	0.5	96.3	182.12	10927.0	1041.0	55	0.3	79.9
24	0.4	96.7	190.04	11403.0	1086.0	55	0.2	80.2
25	0.3	97.0	197.96	11878.0	1131.0	56	0.2	80.3

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 (%)
26	0.2	97.2	205.88	12353.0	1176.0	56	0.1	80.4
27	0.3	97.5	213.80	12828.0	1222.0	57	0.2	80.6
28	0.5	98.0	221.72	13303.0	1267.0	57	0.3	80.9
29	0.1	98.1	229.63	13778.0	1312.0	58	0.1	81.0
30	0.0	98.1	237.55	14253.0	1357.0	58	0.0	81.0
31	0.0	98.1	245.47	14728.0	1403.0	59	0.0	81.0
32	0.2	98.3	253.39	15203.0	1448.0	57	0.1	81.1
33	0.2	98.5	261.31	15678.0	1493.0	55	0.1	81.2
34	0.0	98.5	269.23	16154.0	1538.0	54	0.0	81.2
35	0.2	98.7	277.15	16629.0	1584.0	52	0.1	81.3
36	0.1	98.8	285.06	17104.0	1629.0	51	0.1	81.3
37	0.1	98.9	292.98	17579.0	1674.0	49	0.0	81.4
38	0.1	99.0	300.90	18054.0	1719.0	48	0.0	81.4
39	0.0	99.0	308.82	18529.0	1765.0	47	0.0	81.4
40	0.1	99.1	316.74	19004.0	1810.0	46	0.0	81.5
41	0.0	99.1	324.66	19479.0	1855.0	45	0.0	81.5
42	0.1	99.2	332.57	19954.0	1900.0	43	0.0	81.5
43	0.0	99.2	340.49	20430.0	1946.0	43	0.0	81.5
44	0.0	99.2	348.41	20905.0	1991.0	42	0.0	81.5
45	0.0	99.2	356.33	21380.0	2036.0	41	0.0	81.5
46	0.1	99.3	364.25	21855.0	2081.0	40	0.0	81.6
47	0.0	99.3	372.17	22330.0	2127.0	39	0.0	81.6
48	0.0	99.3	380.08	22805.0	2172.0	38	0.0	81.6
49	0.0	99.3	388.00	23280.0	2217.0	37	0.0	81.6
50	0.0	99.3	395.92	23755.0	2262.0	37	0.0	81.6
Estimated Net Annual Sediment (TSS) Load Reduction =								**82 %**

RAINFALL DATA FROM BARRIE WPCC 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

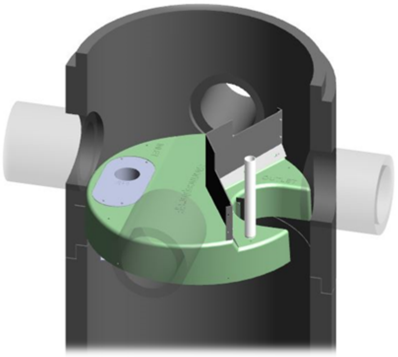
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

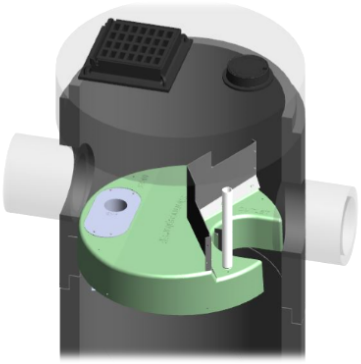
DESIGN FLEXIBILITY

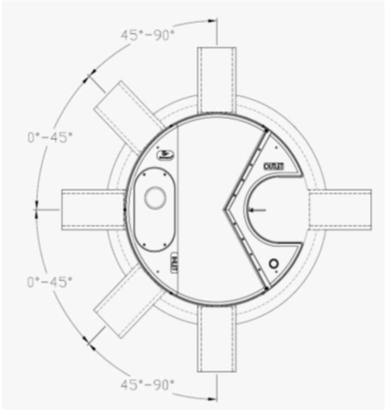
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend 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)	(ft³)	(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/ft³)

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

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:

2.1.1	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 shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

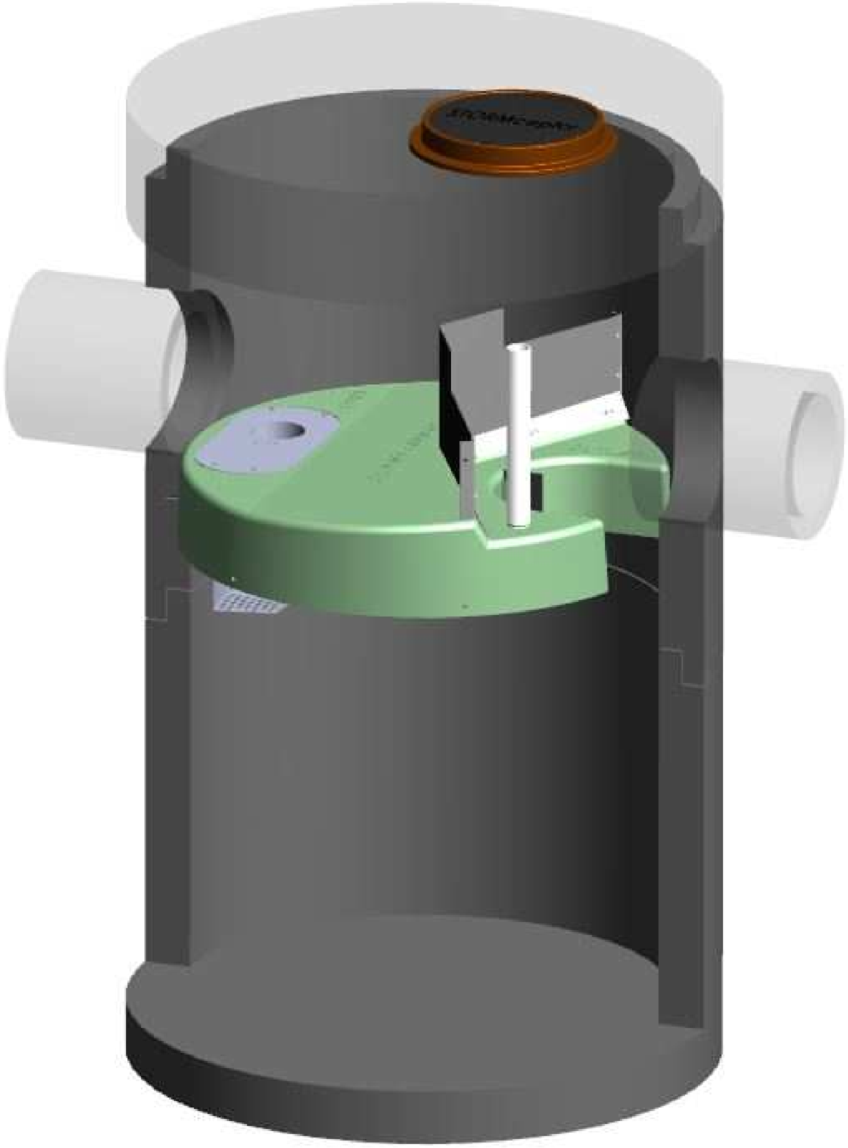
3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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.

Stormceptor® EF

Owner’s Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,180,305
Canadian Patent No. 2,327,768
Canadian Patent No. 2,694,159
Canadian Patent No. 2,697,287
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 729,096
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Japanese Patent No. 5,997,750
Japanese Patent No. 5,555,160
Korean Patent No. 0519212
Korean Patent No. 1451593
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Patent pending

Table of Contents:

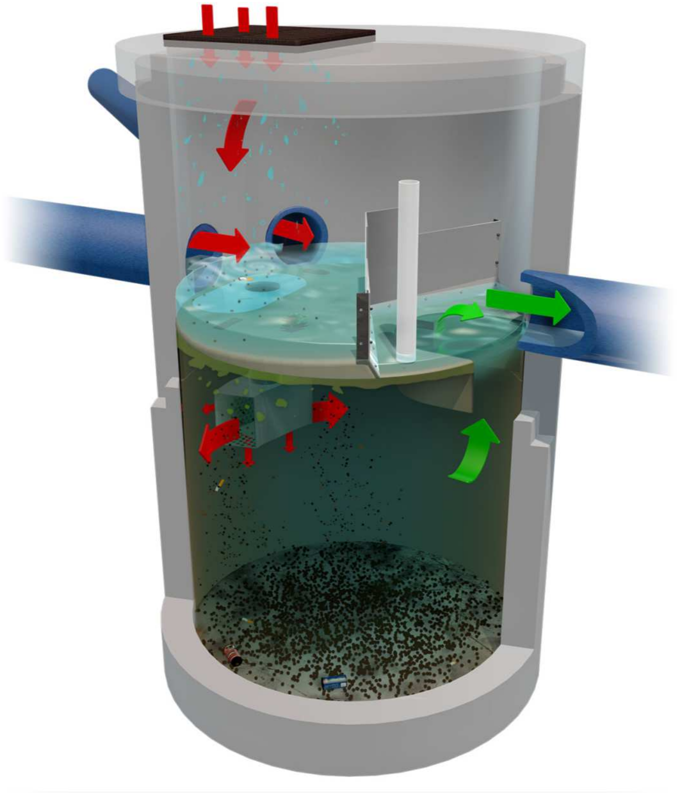
OVERVIEW

Stormceptor® EF is a continuation and evolution of the most globally recognized oil grit separator (OGS) stormwater treatment technology - ***Stormceptor®***. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at flow rates higher than the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention platform ensures sediment is retained during all rainfall events.

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up within the channel surrounding the central riser pipe and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.



COMPONENTS

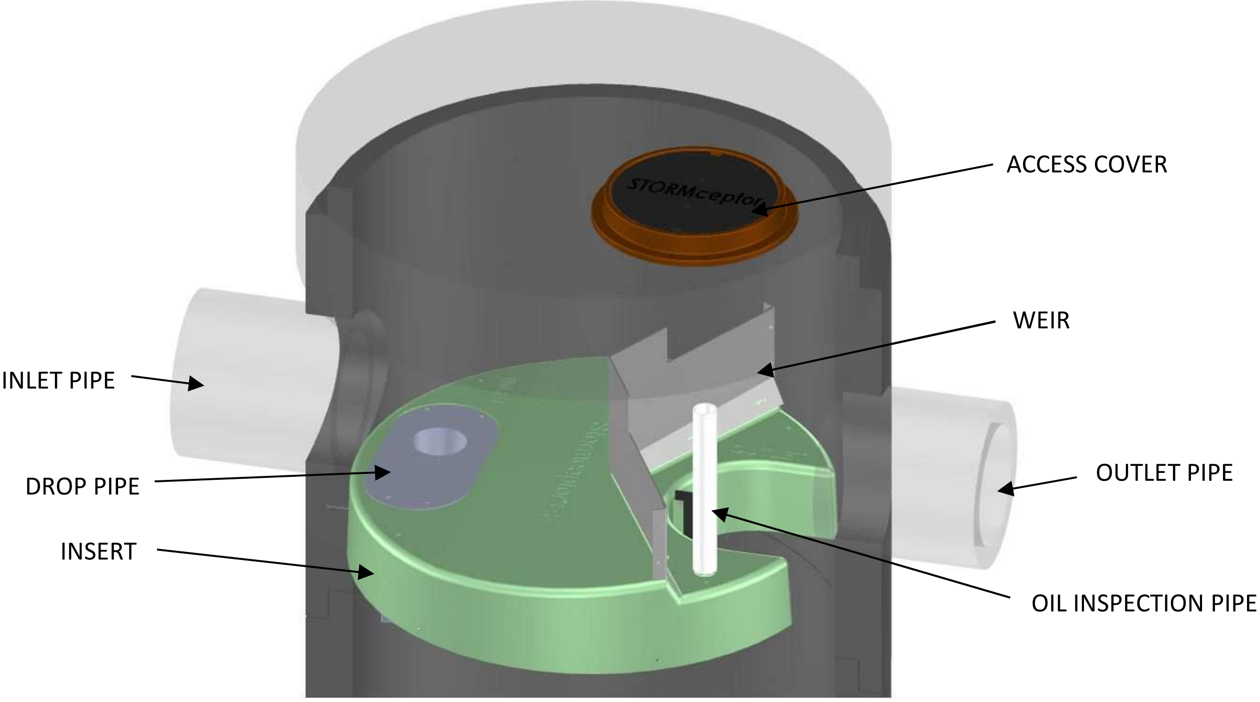


Figure 1

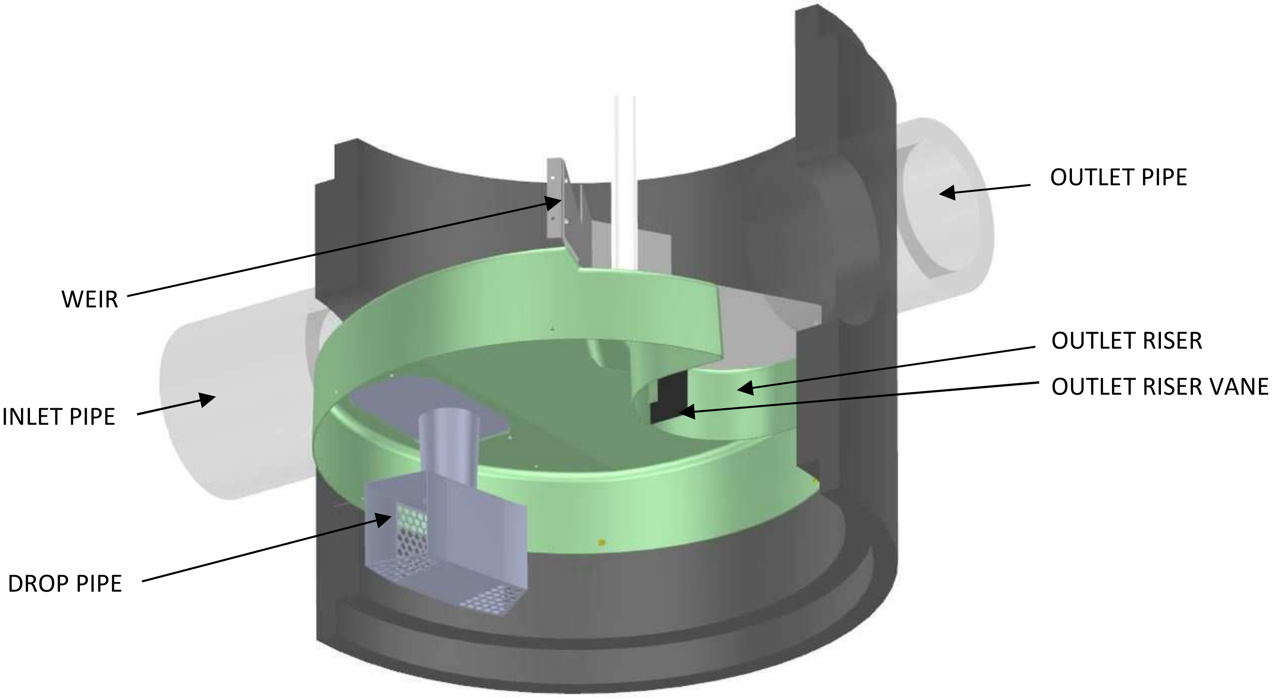


Figure 2

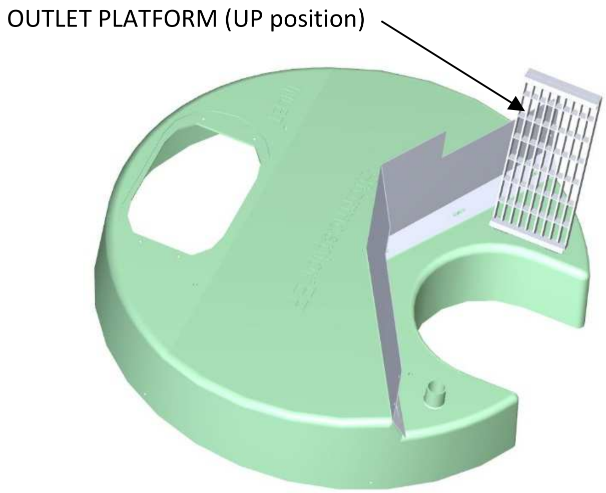


Figure 3A

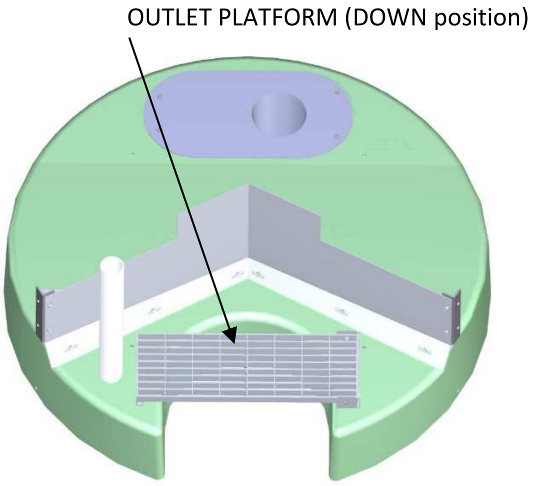


Figure 3B

- **Insert** – separates vessel into upper and lower chambers, and provides double-wall containment of hydrocarbons
- **Weir** – creates stormwater ponding and driving head on top side of insert
- **Drop pipe** – conveys stormwater and pollutants into the lower chamber
- **Outlet riser** – conveys treated stormwater from the lower chamber to the outlet pipe, and provides primary inspection and maintenance access into the lower chamber
- **Outlet riser vane** – prevents formation of a vortex in the outlet riser during high flow rate conditions
- **Outlet platform (optional)** – safety platform in the event of manned entry into the unit
- **Oil inspection pipe** – primary access for measuring oil depth

PRODUCT DETAILS

METRIC DIMENSIONS AND CAPACITIES

Table 1

Stormceptor Model	Inside Diameter (m)	Minimum Surface to Outlet Invert Depth (mm)	Depth Below Outlet Pipe Invert (mm)	Wet Volume (L)	Sediment Capacity [1] (m³)	Hydrocarbon Storage Capacity [2] (L)	Maximum Flow Rate into Lower Chamber [3] (L/s)	Peak Conveyance Flow Rate [4] (L/s)
EF4 / EFO4	**1.22**	**915**	**1524**	**1780**	**1.19**	**265**	**22.1 / 10.4**	**425**
EF6 / EFO6	**1.83**	**915**	**1930**	**5070**	**3.47**	**610**	**49.6 / 23.4**	**990**
EF8 / EFO8	**2.44**	**1219**	**2591**	**12090**	**8.78**	**1070**	**88.3 / 41.6**	**1700**
EF10 / EFO10	**3.05**	**1219**	**3251**	**23700**	**17.79**	**1670**	**138 / 65**	**2830**
EF12 / EFO12	**3.66**	**1524**	**3886**	**40800**	**31.22**	**2475**	**198.7 / 93.7**	**2830**

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m². EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m².

[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s.

U.S. DIMENSIONS AND CAPACITIES

Table 2

Stormceptor Model	Inside Diameter (ft)	Minimum Surface to Outlet Invert Depth (in)	Depth Below Outlet Pipe Invert (in)	Wet Volume (gal)	Sediment Capacity [1] (ft³)	Hydrocarbon Storage Capacity [2] (gal)	Maximum Flow Rate into Lower Chamber [3] (cfs)	Peak Conveyance Flow Rate [4] (cfs)
EF4 / EFO4	**4**	**36**	**60**	**471**	**42**	**70**	**0.78 / 0.37**	**15**
EF6 / EFO6	**6**	**36**	**76**	**1339**	**123**	**160**	**1.75 / 0.83**	**35**
EF8 / EFO8	**8**	**48**	**102**	**3194**	**310**	**280**	**3.12 / 1.47**	**60**
EF10 / EFO10	**10**	**48**	**128**	**6261**	**628**	**440**	**4.87 / 2.30**	**100**
EF12 / EFO12	**12**	**60**	**153**	**10779**	**1103**	**655**	**7.02 / 3.31**	**100**

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 27.9 gpm/ft². EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 13.1 gpm/ft².

[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 5 fps.

IDENTIFICATION

Each Stormceptor EF/EFO unit is easily identifiable by the trade name ***Stormceptor***® embossed on the access cover at grade as shown in **Figure 3**. The tradename ***Stormceptor***® is also embossed on the top of the insert upstream of the weir as shown in **Figure 3**.

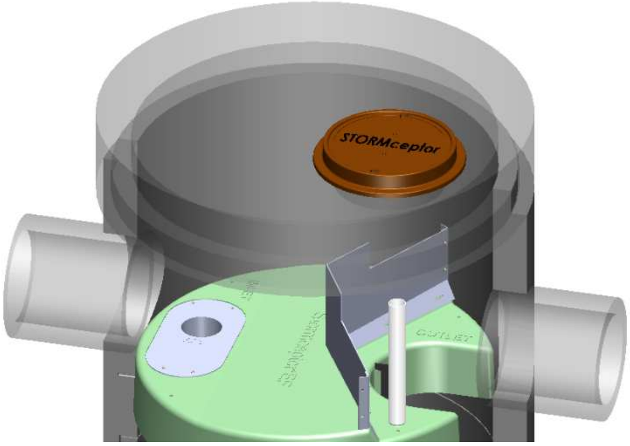


Figure 4

The specific Stormceptor EF/EFO model number is identified on the top of the aluminum Drop Pipe as shown in **Figure 4**. The unit serial number is identified on the top of the insert upstream of the weir as shown in **Figure 4**.

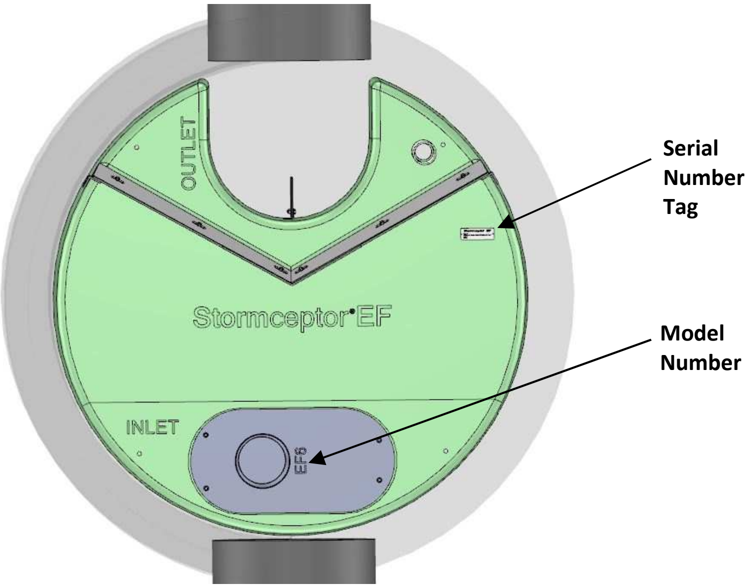


Figure 5

INSPECTION AND MAINTENANCE

It is very important to perform regular inspection and maintenance. Regular inspection and maintenance ensures maximum operation efficiency, keeps maintenance costs low, and provides continued of natural waterways.

Quick Reference

- Typical inspection and maintenance is performed from grade
- Remove manhole **cover(s)** or **inlet grate** to access insert and lower chamber
  NOTE: EF4/EFO4 requires the removal of a **flow deflector** beneath inlet grate
- Use Sludge Judge® or similar sediment probe to check sediment depth through the **outlet riser**
- Oil dipstick can be inserted through the **oil inspection pipe**
- Visually inspect the **insert** for debris, remove debris if present
- Visually inspect the **drop pipe** opening for blockage, remove blockage if present
- Visually inspect **insert** and **weir** for damage, schedule repair if needed
- Insert vacuum hose and jetting wand through the outlet riser and extract sediment and floatables
- Replace flow deflector (EF4/EFO4), inlet grate, and cover(s)
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess pollutant accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

What equipment is typically required for inspection?

- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

When is maintenance cleaning needed?

- If the post-construction inspection indicates presence of construction sediment of a depth greater than a few inches, maintenance is recommended at that time.
- For optimum performance and normal operation the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, see **Table 3**.
- Maintain immediately after an oil, fuel, or other chemical spill.

Table 3

Recommended Sediment Depths for Maintenance Service*

MODEL	Sediment Depth (in/mm)
EF4 / EFO4	8 / 203
EF6 / EFO6	12 /305
EF8 / EFO8	24 / 610
EF10 / EFO10	24 / 610
EF12 / EFO12	24 / 610

* Based on a minimum distance of 40 inches (1,016 mm) from bottom of outlet riser to top of sediment bed

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, disposal costs, and transportation distance.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required (adhere to all OSHA / CCOSH standards)

What conditions can compromise Stormceptor performance?

- Presence of construction sediment and debris in the unit prior to activation
- Excessive sediment depth beyond the recommended maintenance depth
- Oil spill in excess of the oil storage capacity
- Clogging or restriction of the drop pipe inlet opening with debris
- Downstream blockage that results in a backwater condition

Maintenance Procedures

- Maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is maintained from grade through a standard surface manhole access cover or inlet grate.
- In the case of submerged or tailwater conditions, extra measures are likely required, such as plugging the inlet and outlet pipes prior to conducting maintenance.
- Inspection and maintenance of upstream catch basins and other stormwater conveyance structures is also recommended to extend the time between future maintenance cycles.

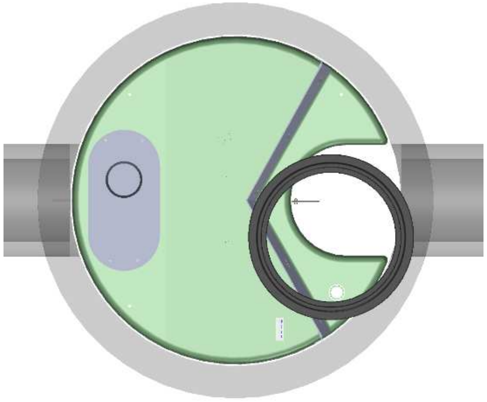


Figure 6

- Sediment depth inspections are performed through the **Outlet Riser** and oil presence can be determined through the **Oil Inspection Pipe**.
- Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths.

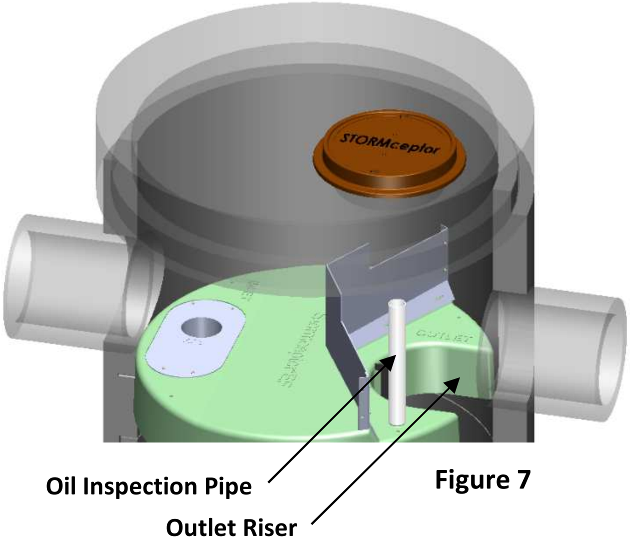


Figure 7

Figure 8

- Visually inspect the insert, weir, and drop pipe inlet opening to ensure there is no damage or blockage.
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

- When maintenance is required, a standard vacuum truck is used to remove the pollutants from the lower chamber of the unit through the **Outlet Riser**.

Figure 9

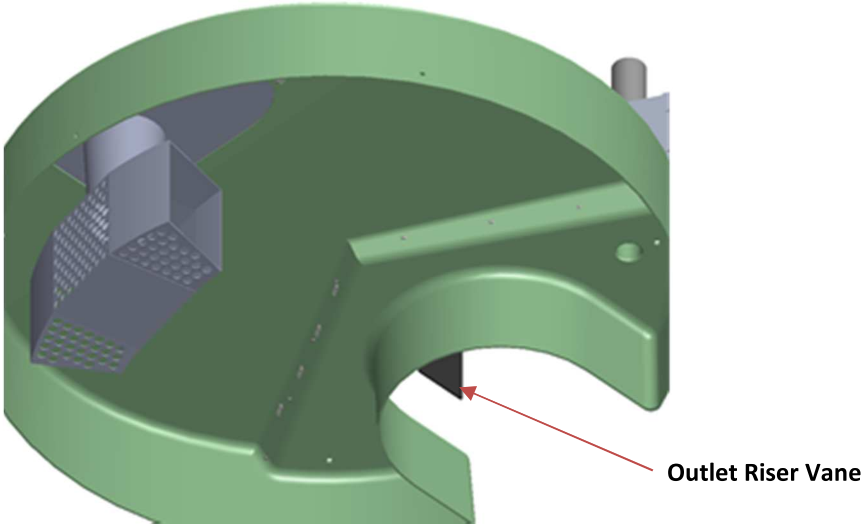


Figure 10

NOTE: The Outlet Riser Vane is durable and flexible and designed to allow maintenance activities with minimal, if any, interference.

Removable Flow Deflector

- Top grated inlets for the Stormceptor EF4/EFO4 model requires a removable flow deflector staged underneath a 24-inch x 24-inch (600 mm x 600 mm) square inlet grate to direct flow towards the inlet side of the insert, and avoid flow and pollutants from entering the outlet side of the insert from grade. The EF6/EFO6 and larger models do not require the flow deflector.

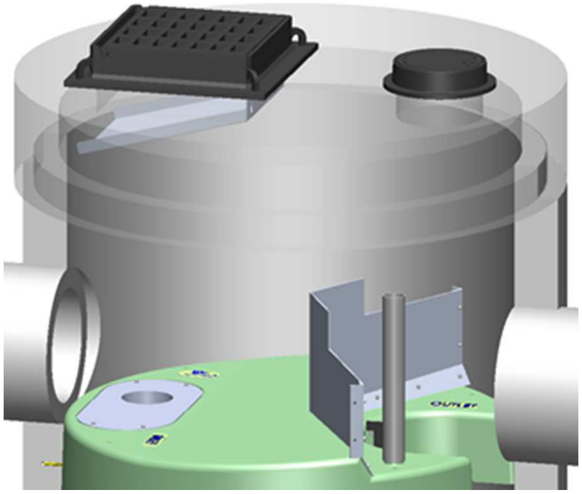
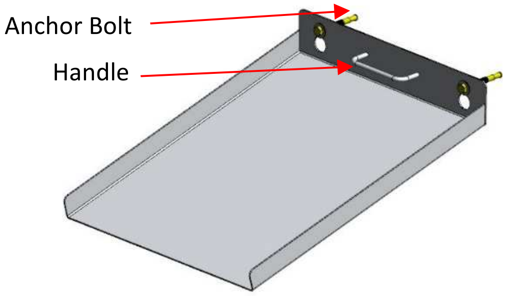


Figure 11

How to Remove:

1. Loosen anchor bolts
2. Pull up and out using the handle



Removable Flow Deflector

Hydrocarbon Spills

Stormceptor is often installed on high pollutant load hotspot sites with vehicular traffic where hydrocarbon spill potential exists. Should a spill occur, or presence of oil be identified within a Stormceptor EF/EFO, it should be cleaned immediately by a licensed liquid waste hauler.

Disposal

Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of material.

Oil Sheens

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EF/EFO may still be functioning as intended.

Oil Level Alarm

To mitigate spill liability with 24/7 detection, an electronic monitoring system can be employed to trigger a visual and audible alarm when a pre-set level of oil is captured within the lower chamber or when an oil spill occurs. The oil level alarm is available as an optional feature to include with Stormceptor EF/EFO as shown in **Figure 11**. For additional details about the Oil Level Alarm please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-systems.

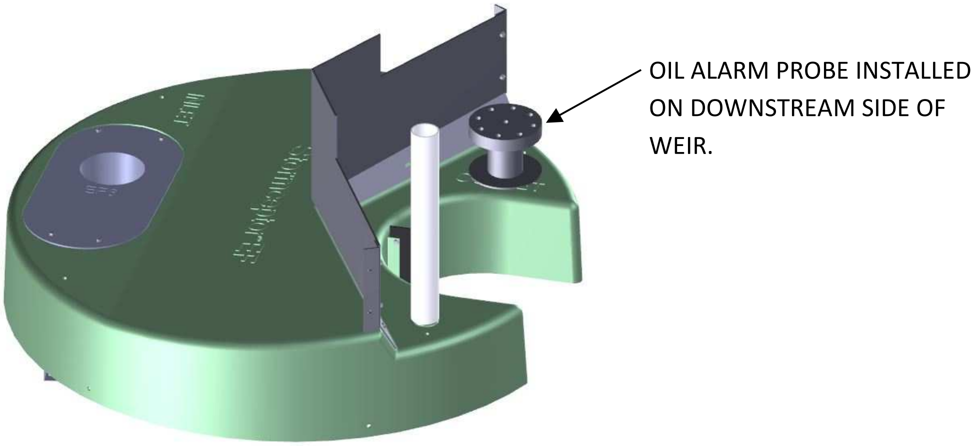


Figure 12

Replacement Parts

Stormceptor has no moving parts to wear out. Therefore inspection and maintenance activities are generally focused on pollutant removal. Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. However, if replacement parts are necessary, they may be purchased by contacting your local Stormceptor representative.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: ________________________

Serial Number: ________________________

Installation Date: ________________________

Location Description of Unit: ________________________

Recommended Sediment Maintenance Depth: ________________________

DATE	SEDIMENT DEPTH (inch or mm)	OIL DEPTH (inch or mm)	SERVICE REQUIRED (Yes / No)	MAINTENANCE PERFORMED	MAINTENANCE PROVIDER	COMMENTS

Other Comments:

Contact Information

Questions regarding Stormceptor EF/EFO can be addressed by contacting your local Stormceptor representative or by visiting our website at **www.stormceptor.com**.

Imbrium Systems Inc. & Imbrium Systems LLC

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United States	1-301-279-8827 / 1-888-279-8826
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◆ Verification Statement ◆ Verification Statement ◆ Verification Statement ◆

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Stormceptor® EF4 and EFO4 Oil-Grit Separators

Developed by Imbrium Systems, Inc.,
Whitby, Ontario, Canada

In accordance with

ISO 14034:2016

Environmental management —
Environmental technology verification (ETV)

John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

November 10, 2017
Vancouver, BC, Canada

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The Stormceptor® EF4 and EFO4 are treatment devices designed to remove oil, sediment, trash, debris, and pollutants attached to particulates from Stormwater and snowmelt runoff. The device takes the place of a conventional manhole within a storm drain system and offers design flexibility that works with various site constraints. The EFO4 is designed with a shorter bypass weir height, which accepts lower surface loading rate into the sump, thereby reducing re-entrainment of captured free floating light liquids.

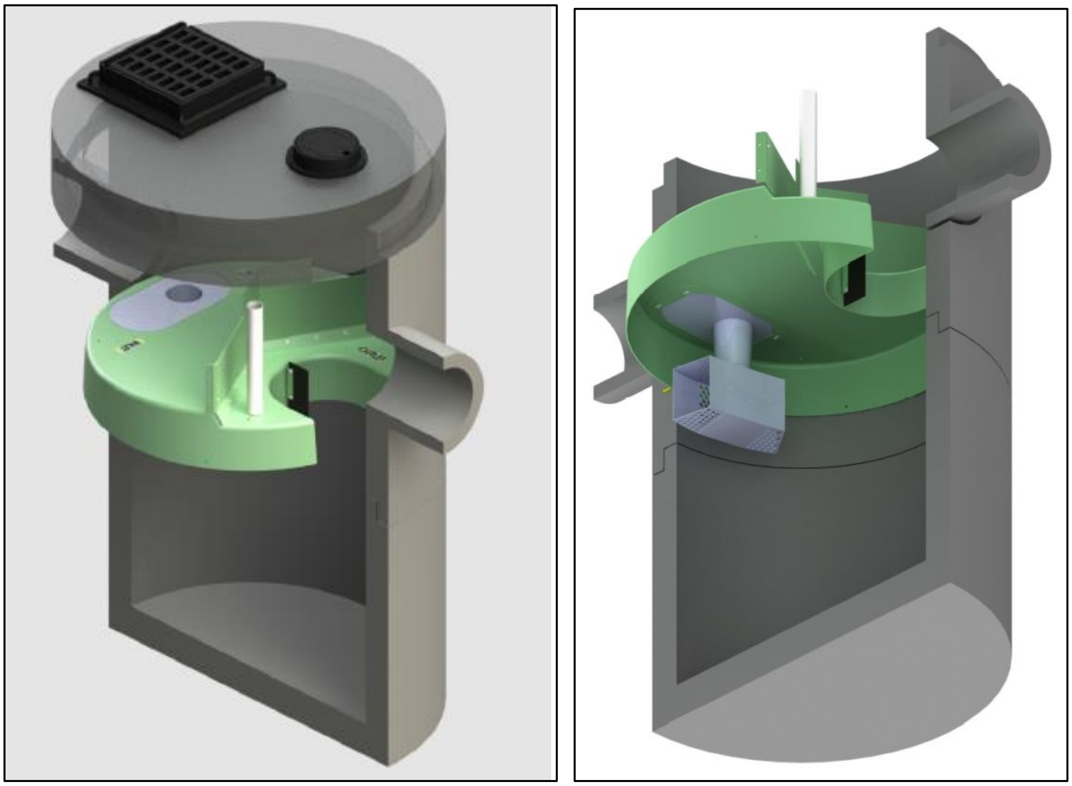

Figure 1. Graphic of typical inline Stormceptor® unit and core components.

Stormwater and snowmelt runoff enters the Stormceptor® EF/EFO's upper chamber through the inlet pipe(s) or a surface inlet grate. An insert divides the unit into lower and upper chambers and incorporates a weir to reduce influent velocity and separate influent (untreated) from effluent (treated) flows. Influent water ponds upstream of the insert's weir providing driving head for the water flowing downwards into the drop pipe where a vortex pulls the water into the lower chamber. The water diffuses at lower velocities in multiple directions through the drop pipe outlet openings. Oil and other floatables rise up and are trapped beneath the insert, while sediments undergo gravitational settling to the sump's bottom. Water from the sump can exit by flowing upward to the outlet riser onto the top side of the insert and downstream of the weir, where it discharges through the outlet pipe.

Maximum flow rate into the lower chamber is a function of weir height and drop pipe orifice diameter. The Stormceptor® EF and EFO are designed to allow a surface loading rate of 1135 L/min/m^2 (27.9 gal/min/ft^2) and 535 L/min/m^2 (13.1 gal/min/ft^2) into the lower chamber, respectively. When prescribed surface loading rates are exceeded, ponding water can overtop the weir height and bypass the lower treatment chamber, exiting directly through the outlet pipe. Hydraulic testing and scour testing demonstrate that the internal bypass effectively prevents scour at all bypass flow rates. Increasing the bypass flow rate does not increase the orifice-controlled flow rate into the lower treatment chamber where sediment is stored. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, treatment continues in the lower chamber at the maximum flow rate. The Stormceptor® EFO's lower design surface loading rate is favorable for minimizing re-entrainment and washout of captured light liquids. Inspection of Stormceptor® EF and EFO devices is performed from grade by inserting a sediment probe through the outlet riser and an oil dipstick through the oil inspection pipe. The unit can be maintained by using a vacuum hose through the outlet riser.

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Imbrium Systems Inc.'s Stormceptor® OGS device, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test [a]:

During the capture test, the Stormceptor® EF OGS device, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 46, 44, and 49 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Stormceptor® EFO, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 42, 40, and 34 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Scour test [a]:

During the scour test, the Stormceptor® EF and Stormceptor® EFO OGS devices, with 10.2 cm (4 inches) of test sediment pre-loaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment storage depth, generate corrected effluent concentrations of 4.6, 0.7, 0, 0.2, and 0.4 mg/L at 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test[a]:

During the light liquid re-entrainment test, the Stormceptor® EFO OGS device with surrogate low-density polyethylene beads preloaded within the lower chamber oil collection zone, representing a floating light liquid volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.5, 99.8, 99.8, and 99.9 percent of loaded beads by mass during the 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2.

---

[a] The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

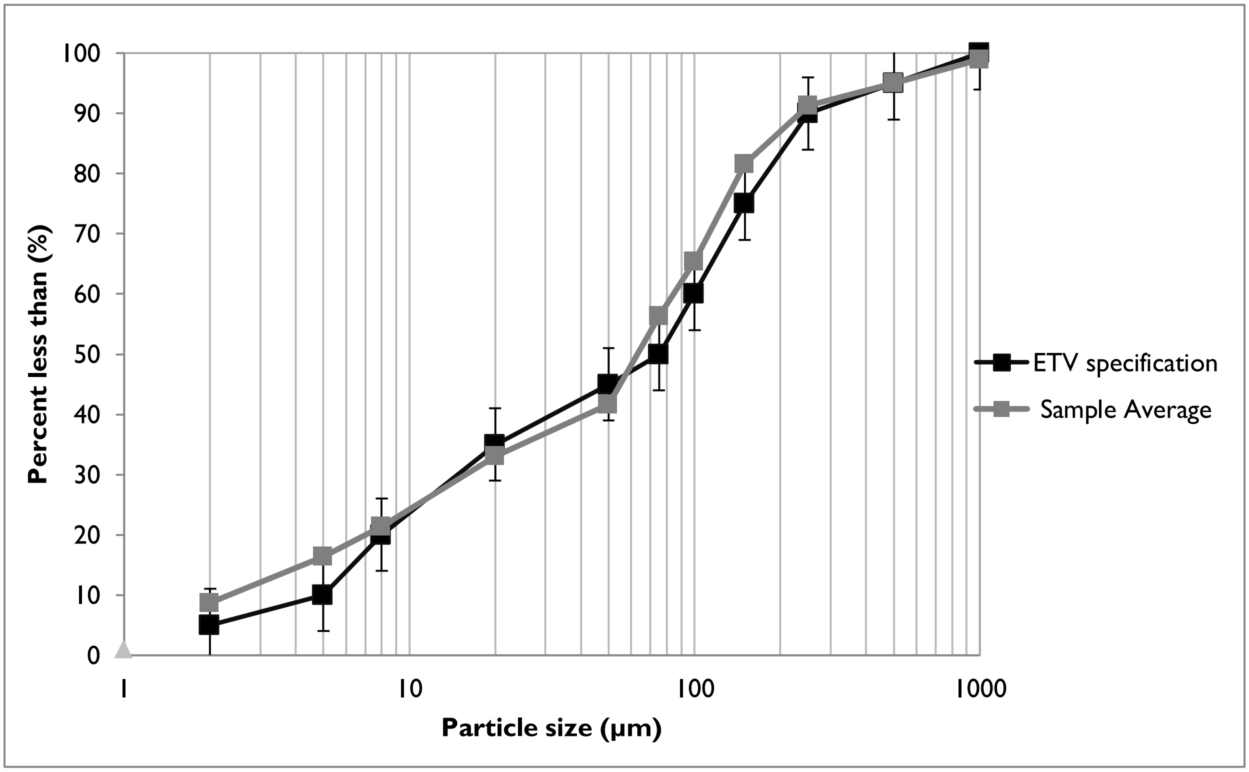

Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at seven surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1). Since the EF and EFO models are identical except for the weir height, which bypasses flows from the EFO model at a surface loading rate of 535 L/min/m^2 (13.1 gpm/ft^2), sediment capture tests at surface loading rates from 40 to 400 L/min/m^2 were only performed on the EF unit. Surface loading rates of 600, 1000, and 1400 L/min/m^2 were tested on both units separately. Results for the EFO model at these higher flow rates are presented in Table 2.

In some instances, the removal efficiencies were above 100% for certain particle size fractions. These discrepancies are not unique to any one test laboratory and may be attributed to errors relating to the blending of sediment, collection of representative samples for laboratory submission, and laboratory analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see Bulletin # CETV 2016-11-0001). The results for "all particle sizes by mass balance" (see Table 1 and 2) are based on measurements of the total injected and retained sediment mass, and are therefore not subject to blending, sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) of the EF4 at specified surface loading rates

Particle size fraction (µm)	**Surface loading rate (L/min/m²)**						
	40	80	200	400	600	1000	1400
>500	90	58	58	100*	86	72	100*
250 - 500	100*	100*	100	100*	100*	100*	100*
150 - 250	90	82	26	100*	100*	67	90
105 - 150	100*	100*	100*	100*	100*	100*	100
75 - 105	100*	92	74	82	77	68	76
53 - 75	Undefined [a]	56	100*	72	69	50	80
20 - 53	54	100*	54	33	36	40	31
8 - 20	67	52	25	21	17	20	20
5 – 8	33	29	11	12	9	7	19
<5	13	0	0	0	0	0	4
All particle sizes by mass balance	**70.4**	**63.8**	**53.9**	**47.5**	**46.0**	**43.7**	**49.0**

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[a] An outlier in the feed sample sieve data resulted in a negative removal efficiency for this size fraction.

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 101 and 171% (average 128%). See text and Bulletin # CETV 2016-11-0001 for more information.

Table 2. Removal efficiencies (%) of the EFO4 at surface loading rates above the bypass rate of 535 L/min/m²

Particle size fraction (µm)	**Surface loading rate (L/min/m²)**		
	600	1000	1400
>500	89	83	100*
250 - 500	90	100*	92
150 - 250	90	67	100*
105 - 150	85	92	77
75 - 105	80	71	65
53 - 75	60	31	36
20 - 53	33	43	23
8 - 20	17	23	15
5 – 8	10	3	3
<5	0	0	0
All particle sizes by mass balance	**41.7**	**39.7**	**34.2**

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 103 and 111% (average 107%). See text and Bulletin # CETV 2016-11-0001 for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the sediment retained by the EF4 at each of the tested surface loading rates. Figure 4 shows the same graph for the EFO4 unit at surface loading rates above the bypass rate of 535 L/min/m².

As expected, the capture efficiency for fine particles in both units was generally found to decrease as surface loading rates increased.

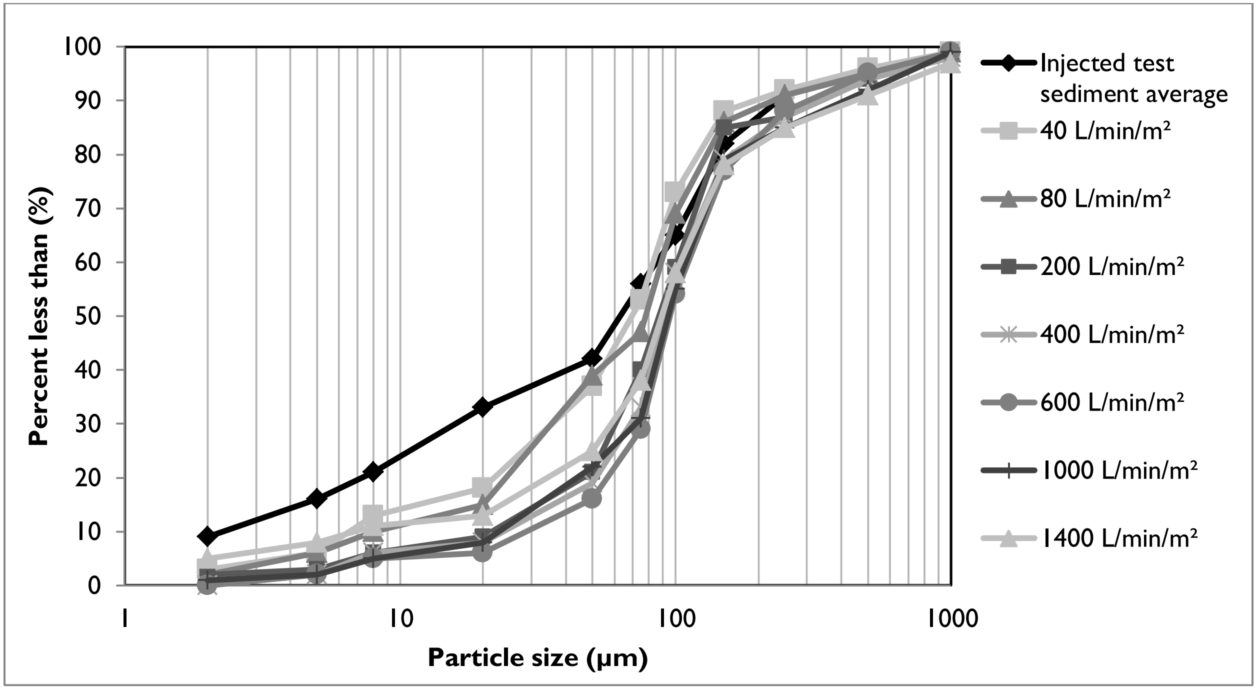

Figure 3. Particle size distribution of sediment retained in the EF4 in relation to the injected test sediment average.

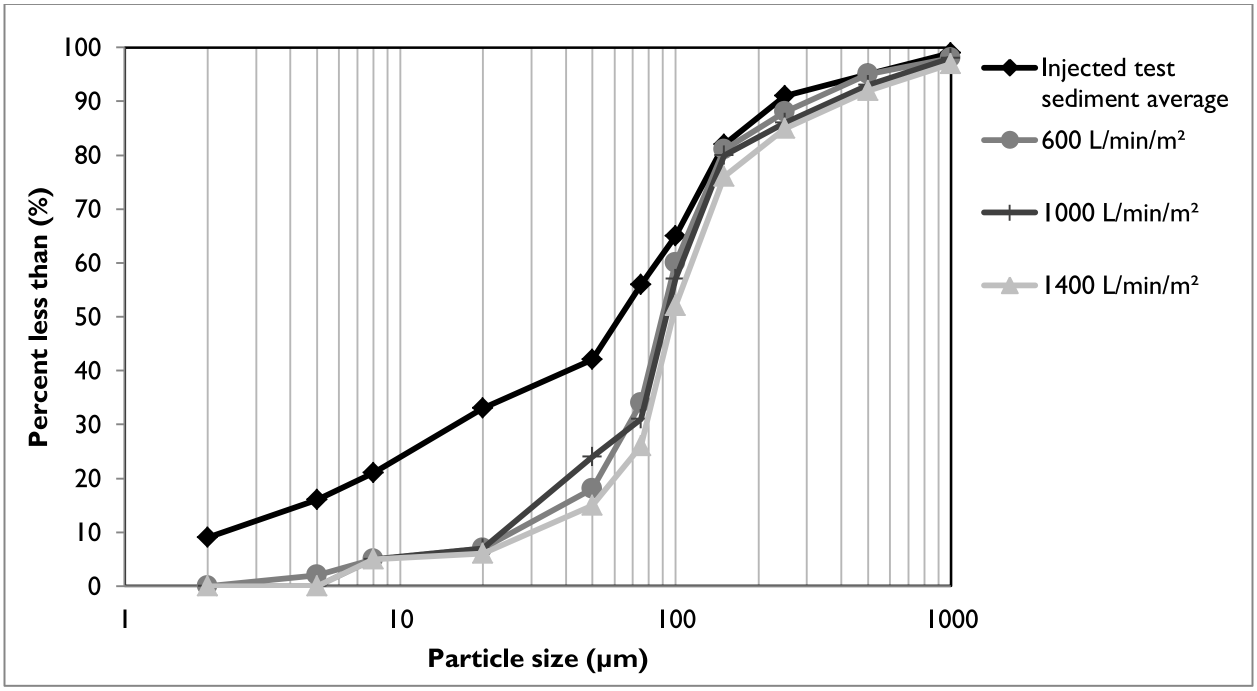

Figure 4. Particle size distribution of sediment retained in the EFO4 in relation to the injected test sediment average at surface loading rates above the bypass rate of 535 L/min/m2

Table 4 shows the results of the sediment scour and re-suspension test for the EF4 unit. The EFO4 was not tested as it was reasonably assumed that scour rates would be lower given that flow bypass occurs at a lower surface loading rate. The scour test involved preloading 10.2 cm of fresh test sediment into the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth. Clean water was run through the device at five surface loading rates over a 30 minute period. Each flow rate was maintained for 5 minutes with a one minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for Suspended Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water. Typically, the smallest 5% of particles captured during the 40 L/min/m² sediment capture test is also used to adjust the concentration, as per the method described in Bulletin # CETV 2016-09-0001. However, since the composites of effluent concentrations were below the Reporting Detection Limit of the Laser Diffraction PSD methodology, this adjustment was not made. Results showed average adjusted effluent sediment concentrations below 5 mg/L at all tested surface loading rates.

It should be noted that the EF4 starts to internally bypass water at 1135 L/min/m², potentially resulting in the dilution of effluent concentrations, which would not normally occur under typical field conditions because the field influent concentration would contain a much higher sediment concentration than during the lab test. Recalculation of effluent concentrations to account for dilution at surface loading rates above the bypass rate showed sediment effluent concentrations to be below 1.6 mg/L.

Table 4. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m²)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L) [a]	Average (mg/L)
1	200	1:00	<RDL	11.9	4.6
		2:00		7.0	
		3:00		4.4	
		4:00		2.2	
		5:00		1.0	
		6:00		1.2	
2	800	7:00	<RDL	1.1	0.7
		8:00		0.9	
		9:00		0.6	
		10:00		1.4	
		11:00		0.1	
		12:00		0	
3	1400	13:00	<RDL	0	0
		14:00		0.1	
		15:00		0	
		16:00		0	
		17:00		0	
		18:00		0	
4	2000	19:00	1.2	0.2	0.2
		20:00		0	
		21:00		0	
		22:00		0.7	
		23:00		0	

		24:00		0.4	
5	2600	25:00	1.6	0.3	0.4
		26:00		0.4	
		27:00		0.7	
		28:00		0.4	
		29:00		0.2	
		30:00		0.4	

---

[a] The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the background concentration. For more information see Bulletin # CETV 2016-09-0001.

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 5. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m²) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device continuously at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m²). Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 5. Light liquid re-entrainment test results for the EFO4.

Surface Loading Rate (L/min/m2)	Time Stamp	Amount of Beads Re-entrained			
		Mass (g)	Volume (L)[a]	% of Pre-loaded Mass Re-entrained	% of Pre-loaded Mass Retained
200	62	0	0	0.00	100
800	247	168.45	0.3	0.52	99.48
1400	432	51.88	0.09	0.16	99.83
2000	617	55.54	0.1	0.17	99.84
2600	802	19.73	0.035	0.06	99.94
Total Re-entrained		295.60	0.525	0.91	--
Total Retained		32403	57.78	--	99.09
Total Loaded		32699	58.3	--	--

---

[a] Determined from bead bulk density of 0.56074 g/cm³

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. During the capture test, the 40 L/min/m² and 80 L/min/m² surface loading rates were evaluated over 3 and 2 days respectively due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit at these lower flow rates. Pumps were shut down at the end of each intermediate day, and turned on again the following morning. The target flow rate was re-established within 30 seconds of switching on the pump. This procedure may have allowed sediments to be captured that otherwise may have exited the unit if the test was

continuous. On the basis of practical considerations, this variance was approved by the verifier prior to testing.

2. During the scour test, the coefficient of variation (COV) for the lowest flow rate tested (200 L/min/m²) was 0.07, which exceeded the specified limit of 0.04 target specified in the OGS Procedure. A pump capable of attaining the highest flow rate of 3036 L/min had difficulty maintaining the lowest flow of 234 L/min but still remained within +/- 10% of the target flow and is viewed as having very little impact on the observed results. Similarly, for the light liquid re-entrainment test the COV for the flow rate of the 200 L/min/m² run was 0.049, exceeding the limit of 0.04, but is believed to introduce negligible bias.

3. Due to pressure build up in the filters, the runs at 1000 L/min/m² for the Stormceptor® EF4 and 1000 and 1400 L/min/m² for the Stormceptor® EFO4 were slightly shorter than the target. The run times were 54, 59 and 43 minutes respectively, versus targets of 60 and 50 minutes. The final feed samples were timed to coincide with the end of the run. Since >25 lbs of sediment was fed, the shortened time did not invalidate the runs.

Verification

The verification was completed by the Verification Expert, Toronto and Region Conservation Authority, contracted by GLOBE Performance Solutions, using the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***. Data and information provided by Imbrium Systems Inc. to support the performance claim included the following: Performance test report prepared by Good Harbour Laboratories, and dated September 8, 2017; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV), and was developed and published by the *International Organization for Standardization (ISO)*. The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the Stormceptor® EF4 and EFO4 please contact:

Imbrium Systems, Inc.
407 Fairview Drive
Whitby, ON
L1N 3A9, Canada
Tel: 416-960-9900
info@imbriumsystems.com

For more information on ISO 14034:2016 / ETV please contact:

GLOBE Performance Solutions
World Trade Centre
404 – 999 Canada Place
Vancouver, BC
V6C 3E2 Canada
Tel: 604-695-5018 / Toll Free: 1-855-695-5018
etv@globeperformance.com

Limitation of verification

GLOBE Performance Solutions and the Verification Expert provide the verification services solely on the basis of the information supplied by the applicant or vendor and assume no liability thereafter. The responsibility for the information supplied remains solely with the applicant or vendor and the liability for the purchase, installation, and operation (whether consequential or otherwise) is not transferred to any other party as a result of the verification.

APPENDIX E

Preliminary Engineering Drawings

PEL
PINESTONE ENGINEERING LTD.

NOTE:
PROPOSED SUMMERSET ROAD DESIGN SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. ROADWAY CONSTRUCTION TO BE COMPLETED IN 2021.

The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.

PEL
PINESTONE ENGINEERING LIMITED | www.pel.ca

BENCHMARK
● AS NOTED ON PLANS

SEAL

DRAWN BY: J.L.
CHECKED BY: J.V.
DESIGNED BY: D.H.
SCALE: 1:500
DATE: AUG. 2020

NO.	YY.MM.DD	REVISION	BY

NORTH ARROW

PROJECT:
BEAR CREEK VILLAGE
CITY OF BARRIE

DRAWING:
EXISTING CONDITIONS PLAN

PROJECT No. : 19-11476B
DRAWING No. EX-1

LEGEND:

⌖	PROP. FIRE HYDRANT & VLV
⋈	PROP. VALVE AND BOX
⊥	PROP. TEE
●	PROP. WATER SERVICE
—	PROP. WATERMAIN
—	PROP. STORM SEWER
●	PROP. STMMH
●	PROP. CBMH
●	PROP. DCBMH
■	PROP. DCB
■	PROP. DICB
—	PROP. SANITARY SEWER
– – –	PROP. SANITARY SERVICE
●	PROP. SANITARY MANHOLE
▲	PROP. HYDRO TRANSFORMER
▨	PROP. UTILITY CROSSING
⬡	STREETLIGHT POWER PEDESTAL
86	LOT NUMBER
■	PROPOSED DRIVEWAY
⍿	STREET / TRAFFIC SIGN
SMB	SUPER MAILBOX PAD

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DESIGNED BY: D.H.	
SCALE: 1:500	DATE: AUG. 2020

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NORTH ARROW

PROJECT:
BEAR CREEK VILLAGE
CITY OF BARRIE

DRAWING:
SITE SERVICING PLAN

PROJECT No. : 19-11476B

DRAWING No. SERV-1

LEGEND

— — —	SITE BOUNDARY
— — —	LEGAL BOUNDARY
- - - -	PROPERTY SETBACK LINE
× 247.75	PROPOSED ELEVATION POINT
×247.90 T/C	PROPOSED TOP OF CURB ELEVATION
230.00m	EXISTING MAJOR CONTOUR
229.50m	EXISTING MINOR CONTOUR
⇦	DIRECTION OF MAJOR OVERLAND FLOW
0.00% →	PROPOSED DRAINAGE GRADIENT, DIRECTION
┬┬┬	PROPOSED EMBANKMENT
▨	PROPOSED RIPRAP
— · · — · · —	PROPOSED DRAINAGE DITCH
× (300.00)	PROPOSED DITCH ELEVATION
× *300.00 EX.*	EXISTING GRADE ELEVATION

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NORTH ARROW

PROJECT:
BEAR CREEK VILLAGE
CITY OF BARRIE

DRAWING:
SITE GRADING PLAN

PROJECT No. : 19-11476B
DRAWING No. GP-1

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NORTH ARROW

PROJECT:
BEAR CREEK VILLAGE
CITY OF BARRIE

DRAWING:
PRE DEVELOPMENT
CATCHMENT PLAN

PROJECT No. :
19-11476B

DRAWING No.
PRE-1

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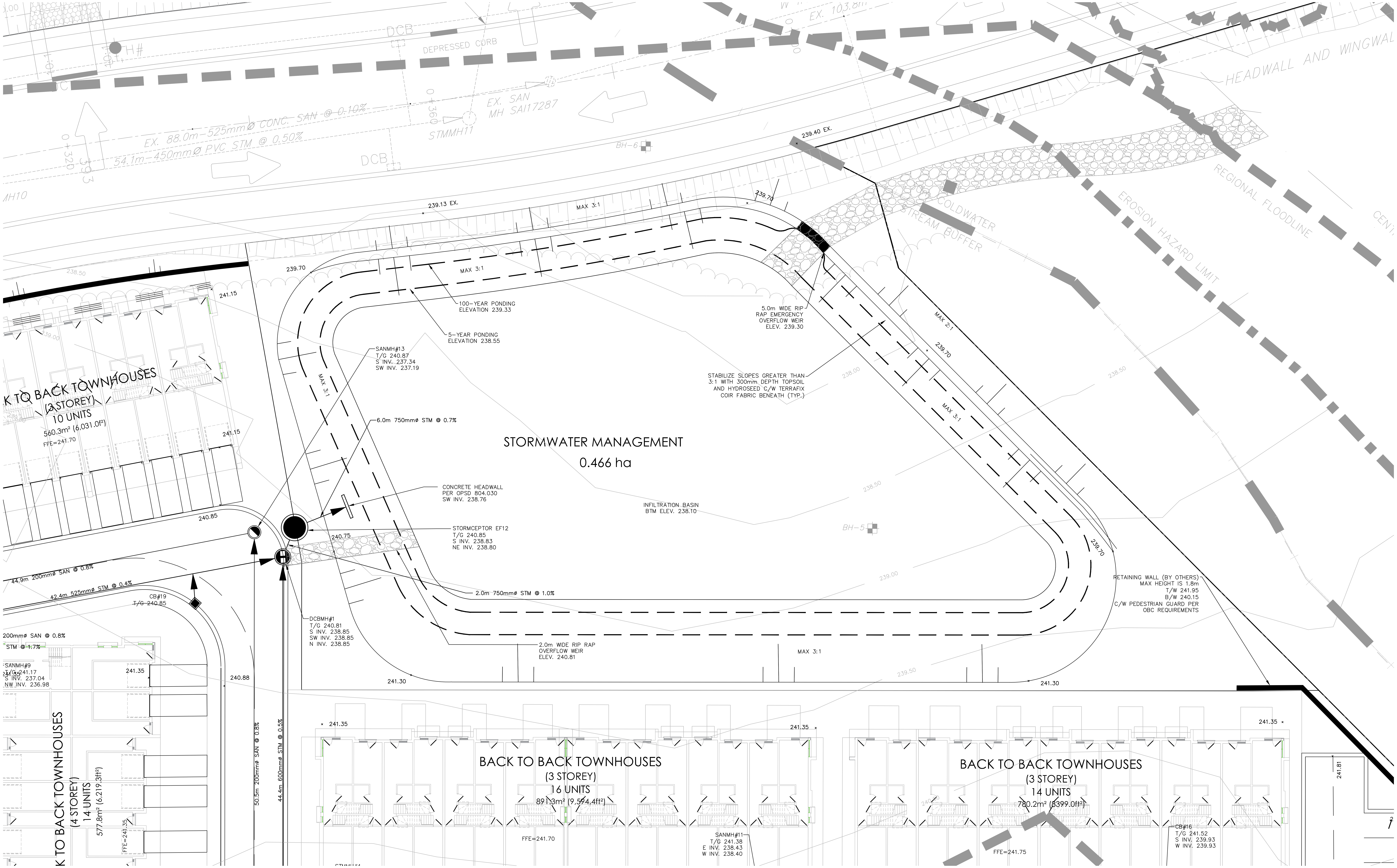
NORTH ARROW

PROJECT:
BEAR CREEK VILLAGE
CITY OF BARRIE

DRAWING:
POST DEVELOPMENT
CATCHMENT PLAN

PROJECT No. :
19-11476B

DRAWING No.
POST-1



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D.H.	
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1:200	AUG. 2020

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NORTH ARROW

PROJECT:
BEAR CREEK VILLAGE
CITY OF BARRIE

DRAWING:
STORMWATER MANAGEMENT
INFILTRATION FACILITY

PROJECT No. :
19-11476B

DRAWING No.
SWM-1

LEGEND

▬ ▪ ▪ ▬	PROPERTY LINE
───	PROP. STORM SEWER
⊘	EX. SANITARY MANHOLE
◐	PROP. SANITARY MANHOLE
●	PROP. STORM MANHOLE
■	PROP. CATCHBASIN
⊙	PROP. CATCHBASIN MANHOLE
▬	STORM CATCHMENT BOUNDARY
20	CATCHMENT ID NUMBER
1.31	CATCHMANT AREA (HECTARES)
0.45	RUNOFF COEFFICIENT
⇦	DIRECTION OF OVERLAND FLOW

BEAR CREEK RESIDENTIAL DEVELOPMENT
City of Barrie

STORM SEWER DESIGN SHEET
ENGINEERING AND PUBLIC WORKS

Project Number: 19-11476B
Date: August 24, 2020
Design By: DPH
Checked By: JHV
File: Z:\Project Documents\11476B Bear Creek Village\PEL Functional Servicing Report - Rezoning\FSR\Design Sheets\Storm Sewer Design Sheet - DH.xls

Drainage Area Plan No: See Drawing STM-1

Design Parameters
5 YEAR STORM
Q=kAIR, k=0.00278
Intensity (I) = a/(tc+b)^c
a = 853.608
b = 4.699
c = 0.766
Manning's "n" 0.013
Min. Velocity 0.750 m/s
Max. Velocity 4.000 m/s

PINESTONE ENGINEERING LTD.

LOCATION				STORMWATER FLOW 5 YEAR STORM								DESIGN					
STREET	AREA NUMBER	MANHOLE LOCATION FROM MH	TO MH	AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME TOTAL	IN PIPE	RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
				ha		ha	ha	min	min	mm/hr	L/s	mm	m	%	L/s	m/s	m/s
NORTH OUTLET																	
Catchment 301	301	CB#1	CB#2/CBMH#1	0.05	0.78	0.0413	0.0413	10.0000	0.6809	108.92211	12.47287	250	25.3	0.30	32.57171	0.6635	0.6193
Catchment 302	302	CBMH#1	STMMH#1	0.61	0.69	0.4209	0.4622	10.6809	0.7424	105.20902	134.71014	450	49.2	0.30	156.15906	0.9819	1.1045
		STMMH#1	CBMH#2				0.4622	11.4233	0.5205	101.47755	129.93234	450	34.3	0.30	156.15906	0.9819	1.0983
Catchment 303	303	CBMH#2	STMMH#2	0.52	0.54	0.2797	0.7420	11.9438	0.8018	99.03739	203.54454	525	58.9	0.30	235.55481	1.0881	1.2244
Catchment 304	304	CB#5	CBMH#3	0.17	0.85	0.1411	0.1411	10.0000	0.3621	108.92211	42.57188	300	33.4	1.50	118.43376	1.6755	1.5375
Catchment 305	305	CBMH#3	STMMH#2	0.18	0.82	0.1451	0.2862	10.3621	0.0732	106.91065	84.76783	300	8.0	1.50	118.43376	1.6755	1.8213
Catchment 306	306	STMMH#2	DCBMH#1	0.06	0.90	0.0520	1.0802	10.4353	0.4666	106.51429	318.71307	575	42.4	0.40	346.67095	1.3350	1.5144
Catchment 307	307	CB#7	CBMH#5	0.23	0.82	0.1911	0.1911	10.0000	0.8979	108.92211	57.64552	375	41.8	0.20	78.41002	0.7099	0.7759
Catchment 308	308	RYCB#1	CBMH#5	0.05	0.30	0.0159	0.0159	10.0000	0.6036	108.92211	4.79726	150	26.6	0.90	14.44789	0.8176	0.7345
Catchment 309	309	CBMH#5	STMMH#3	0.14	0.85	0.1216	0.3285	10.8979	1.3496	104.08575	94.71519	450	71.1	0.20	127.50334	0.8017	0.8780
Catchment 310	310	RYCB#2	CBMH#6	0.03	0.40	0.0120	0.0120	10.0000	0.3140	108.92211	3.62057	150	20.8	3.50	28.49163	1.6123	1.1042
Catchment 311	311	CB#12	STMMH#3	0.04	0.62	0.0267	0.0387	10.3140	0.1493	107.17302	11.47697	300	12.8	3.50	180.91055	2.5594	1.4294
Catchment 312	312	RYCB#3	STMMH#3	0.03	0.42	0.0122	0.0122	10.0000	0.5721	108.92211	3.67488	150	32.8	2.30	23.09655	1.3070	0.9555
Catchment 313	313	CB#10	STMMH#3	0.33	0.76	0.2516	0.2637	10.5721	0.7598	105.78233	77.28032	300	72.0	1.10	101.42061	1.4348	1.5794
		STMMH#3	CBMH#6				0.6309	10.4632	0.1541	106.36397	185.88388	450	13.3	0.50	201.60049	1.2676	1.4383
Catchment 314	314	CBMH#6	STMMH#4	0.25	0.78	0.1934	0.8244	10.6173	0.2925	105.54319	241.00255	525	24.9	0.40	271.99526	1.2565	1.4188
Catchment 315	315	CB#15	CB#17	0.36	0.85	0.3035	0.3035	10.0000	0.7675	108.92211	91.55518	375	71.0	0.90	166.33278	1.5060	1.5419
Catchment 316	316	CB#17	STMMH#4	0.27	0.82	0.2206	0.5240	10.7675	0.2343	104.75752	152.06215	375	24.0	0.90	166.33278	1.5060	1.7074
		STMMH#4	DCBMH#1				1.3484	11.5349	0.4241	100.94260	377.02189	600	44.0	0.50	434.17173	1.5356	1.7291
Catchment 317	317	DCBMH#1	WETLAND	0.28	0.72	0.2009	2.6295	10.9019	0.0568	104.06528	757.97611	750	8.0	0.70	931.43437	2.1083	2.3492

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DESIGNED BY: D.H.
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NORTH ARROW

PROJECT:
BEAR CREEK VILLAGE
CITY OF BARRIE

DRAWING:
STORM SEWER
CATCHMENT PLAN

PROJECT No. :
19-11476B

DRAWING No.
STM-1