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PROPOSED SENIOR LIVING RESIDENTIAL DEVELOPMENT
60 HENDERSON STREET
PORT HOPE, ONTARIO

PROJECT No.: 21241(PH)

FUNCTIONAL SERVICING & STORMWATER MANAGEMENT REPORT

OWNER:

NAUTICAL LANDS GROUP

Prepared By:

THE ODAN/DETECH GROUP INC.

1st Submission – January 2022

2st Submission – November 2022

3rd Submission – April 2023

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1.0 BACKGROUND

The property under study is a 1.82 ha site located at 60 Henderson Street in Port Hope. The site is bounded by Henderson Street to the east, a grocery store to the south (Davis' Your Independent Grocer), Home Hardware Building Centre and vacant area to the west, and a vacant area to the north. Presently, the site is vacant land with vegetated cover. Refer to the Aerial Photo of the Existing Site in **Appendix A** for additional details.

It is proposed by Nautical Lands Group (NLG) to construct 36 new townhouses (no basements) and a 4-storey apartment building with 40 two-bedroom units and 34 one-bedroom units. The rest of the site will be comprised of surface parking and landscape. Refer to **Figure 1** below for further information regarding the proposed layout of the site.

In general, the property surface topography is higher in the north-east and slopes gently towards the south-west. For detailed topography of the existing site conditions, refer to **Appendix A** for the latest topographic survey prepared by Sylvester & Brown Land Surveying Ltd., dated July 23, 2021.

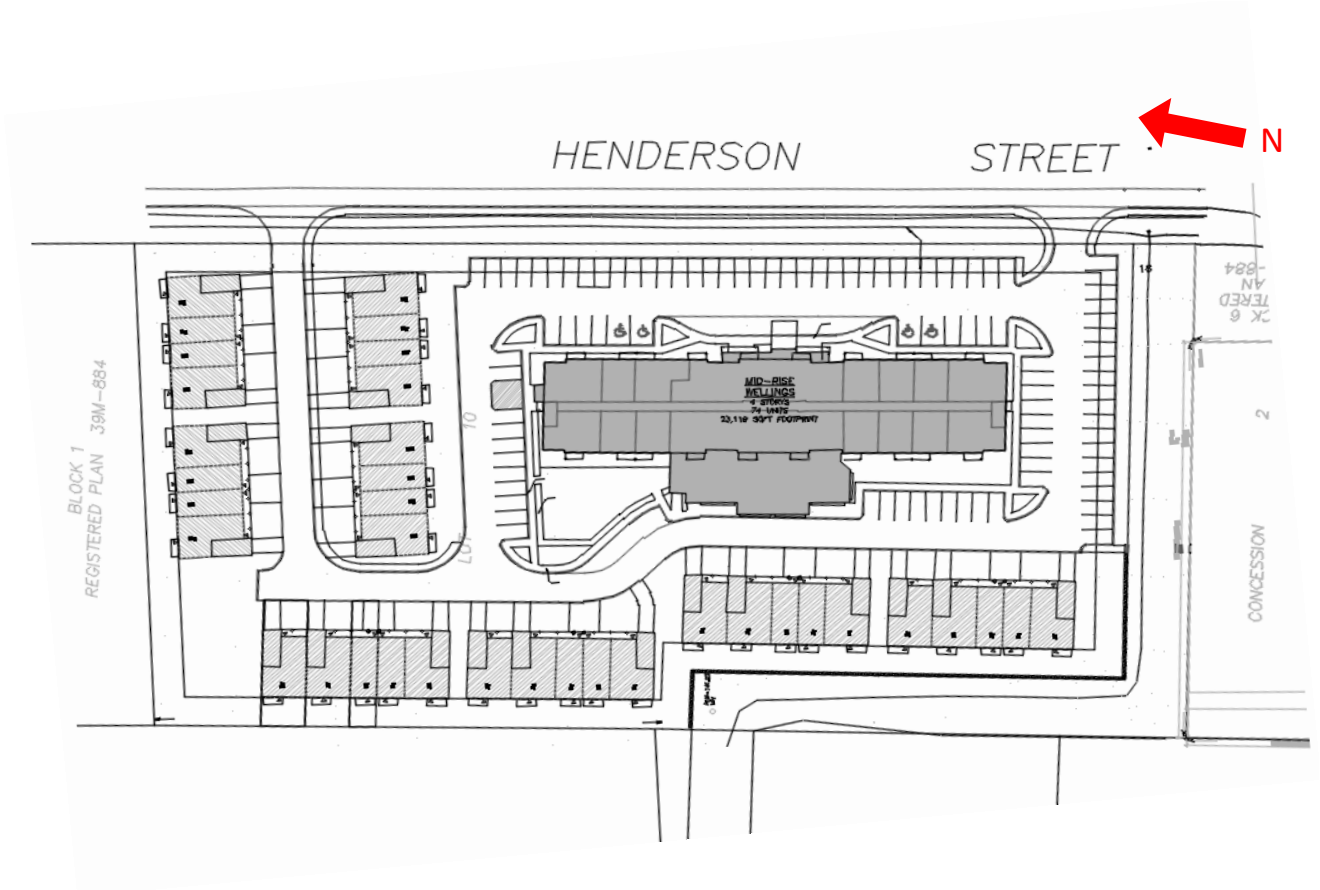

Figure 1 is an Excerpt from the Architectural Site Plan, prepared by NLG. For detailed information regarding the layout of the proposed development, please refer to the latest drawings prepared by NGL. For general existing site conditions see **Appendix A**.

2.0 SCOPE OF WORK

THE ODAN/DETECH GROUP INC. was retained by the owner, **Nautical Lands Group**, to review the site, collect data, evaluate the site for the proposed land use and present the findings in an Engineering Report.

This report will evaluate the serviceability of the site with respect to sanitary, water and storm services and also evaluate the stormwater management (SWM) strategy that will be implemented to meet the Municipality of Port Hope design criteria.

3.0 SERVICING DESIGN CONSIDERATIONS

3.1 Sanitary Wastewater Disposal

Existing Condition

On the east side of the subject property, an existing 250mm diameter PVC sanitary sewer is located in the middle of Henderson St, which flows southerly towards the service corridor, where it is connected to the a 300mm diameter PVC sanitary sewer. This continues to the south-west side of the subject property where an existing 300mm diameter PVC sanitary sewer is located within a service corridor that flows northerly. At the mid-west side of the property the sewer bends and continues to flow in a westerly direction to Fox Road.

A summary of the existing and proposed land uses for the sanitary flows which outlet to Fox Road are shown in Table 1 below.

Table 1 – Summary of Land Uses for Sanitary Flow Calculations

		Commercial		Residential	
Land Use	Site Area (ha)	Floor Area (m^2)	Total Population	No. of Units	Total Population
Existing	1.822	0	0	0	0
Proposed	1.822	0	0	110	229

i) Pre-Development Site

For calculating the population increase for the site, the existing population was assumed to be zero because the site is vacant land.

ii) Post-Development Site

The following Municipality of Port Hope standards for population densities and flow rates will be used to calculate the sanitary flows from the proposed development.

Residential:

- 1.4 persons/unit for 1 bedroom apartment
- 2.1 persons/unit for 2 bedroom apartment

Flow Rates:

- flow rate of 450 L/person/day – residential

The infiltration factor for the City is 0.26 L/s per hectare.

The above values are based on City of Toronto Design Guidelines as discussed with the Municipality of Port Hope Engineering Department.

Sanitary flows from the proposed development are summarized as follows.

Table 2– Calculated Sanitary Sewage Flows from Proposed Development	
Peak Flow from Site (L/s)	4.92
Infiltration (L/s)	0.47
Total = Peak Flow + Infiltration (L/s)	**5.39**

Proposed Sanitary Servicing

Proposed Condition

The proposed development consists of a senior living residential apartment and related senior living townhomes. Refer to the Architectural Statistics in Appendix A are provided for on the Architectural Site Plan.

The proposed site will utilize the existing sanitary sewer located on the service corridor. The site will propose a 200mm diameter sewer to capture the flow from the proposed 36 new townhouses and 74 units 4-storey apartment building. The size of the outlet sewer will be confirmed by Mechanical at the time of detailed design, adjustments may be required at that time.

Based on the population and flow rates the proposed site will have a peak flow of 5.42 L/s. The calculations for the site sanitary flows are included in **Appendix B** and are summarized below in **Table 3.**

Table 3– Summary of Sanitary Flows from the Site

Location of Outlet	Existing Peak Flow (l/s)	Proposed Peak Flow (l/s)
Henderson Street	0	5.39

3.2 Water Distribution

Existing Condition

There is an existing 300mm diameter ductile iron watermain located on the east side of Henderson Street.

There are existing public fire hydrants located on the Henderson Street of the subject site which cover a portion of said site.

Hydrant flow tests for the hydrants described have been performed by SCG process on January 21st of 2022 with the following results.

Table 4– Existing Hydrant Pressure/Flow Conditions

Hydrant Location	Static Pressure (Psi)	Flow @ 20 Psi (USGPM)
60 Henderson Street	65.9	3338

Proposed Condition

It is proposed to connect the site to the existing 300mm diameter watermain located on Henderson Street for domestic and fire-fighting purposes. New 200mm fire & 100mm domestic will be provided to the site.

The unit rate and peaking factors of water consumption, minimum pipe size and allowable pressure in line were established from the Municipality of Port Hope Guidelines. The fire flow water demand is calculated as per FUS 1999 manual.

The pressures and volumes must be sufficient for peak hour conditions and under fire conditions as established by the Ontario Building Code 2006. The minimal residual pressure under fire conditions is 140 kpa. (or 20.3 psi).

The firefighting calculations are based on a fire resistive rating of a sprinklered building with protected steel.

Please refer to **Appendix C** for further details.

The water demand of the proposed site is calculated as follows:

<u>Residential Water Demand</u>

a)	Average Day domestic demand -	using 270L/cap/day (229 persons, from sanitary calculations)	0.72 L/sec
b)	Peak day demand -	1.8 x daily demand	1.30 L/sec
c)	Peak hour demand -	3.0 x daily demand	2.16 L/sec
d)	Fire flow (Fire Resistive)		301.3 L/sec

Table 5 – Total Water Demand for the Site – FUS -

	L/sec	USGM
Peak Day Demand	1.30	20.6
Fire Flow Demand	300	4755
Total Water Demand	301.3	4776
Actual Flow at 20 PSI Residual Pressure	210.6	3338

Based on the hydrant flow testing results and as determined using the FUS method for calculating fire flows the existing main is not sufficient to service the subject development. However, since the FUS is typically used for planning purposes the required fire flows will be based on the OBC at the detailed design stage to show that adequate flows are available to service the building.

In general, a residential development requires 150 l/sec (2,378 USGPM) for fire protection. The OBC fire flow calculation for a sprinklered building is provided on the next page based on the same building from a similar development. This shows the required fire flow for this building when sprinklered. The following was provided by Jain Sustainability Consultants Inc. for a similar site proposed in Bradford, Ontario. The full report prepared by JSCI can be found in Appendix

Jain

Jan. 17, 2022

Re: 500 Holland Street W., Bradford ON.
Fire Protection Water Supply Requirement for Part 3 of O.B.C.

The proposed commercial building at 500 Holland Street W., Bradford ON. is a Seniors apartment building. The entire building is of combustible construction, sprinklered.

The site and building is serviced by municipal water supply (Water flow and pressure test attached)

Existing Site (attached)

The Subject Site is located on the (short description of site and surrounding areas)

To the North: Vacant Land
To the East: Existing Grocery Store
To the West: Langford Blvd
To the South: Miller Park Ave

Calculation: Q=KVStot

K: building construction classification

V: building volume

Stot: building property line distances

Stot = 1+ Σ Stot

Building classifications by group:

Apartment Building: C (K=18)

Building Volume:

24,625 m³

Building multiple exposures:

18.1 m; Stot = 0

27.6 m; Stot =0

3.0 m1.5m, Stot=0.5

26.5 m, Stot = 0

Stot = 1+0+0+0.5+0

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thinking globally, delivering locally

Jain

Q=18 x 24,626 m³ x 1.5

Q=664,902 m³

According to Fire protection Water Supply guideline for Part 3 of OBC A3.2.5.7, Table 2:

Minimum water supply flow rate for Q≥270,000

Required water supply shall be 9000 L/min (150 L/sec)

Conclusion:

Municipal water supply graph shows sufficient flow and pressure used for sprinkler and inside and outside hose stream requirement as referenced by Article 3.2.5.13 of the Building Code and NFPA 13.

Yours very truly,

D. Jain, M.Eng., M.B.A., P.Eng., C.E.M., L.A.P.

LICENSED PROFESSIONAL ENGINEER
DINESH JAIN
PROVINCE OF ONTARIO

Enclosures

1. Site Plan
2. Water flow and pressure test

As can be seen above and based on the OBC the water demand can be adjusted as shown in Table 6;

Table 6 – Total Water Demand for the Site – OBC -

	L/sec	USGM
Peak Day Demand	1.30	20.6
Fire Flow Demand	150	2,378
Total Water Demand	151.3	2,398
Actual Flow at 20 PSI Residual Pressure	210.6	3,338

As can be seen above the existing water supply will be adequate to provide the necessary domestic and fire flow to the proposed site under the Ontario Building Code applied sprinklered building calculations. Final calculations will be provided to confirm the above by a qualified sprinkler consultant at the detailed design stage.

3.3 Stormwater Management

Existing Condition

On the south side of the subject property, there is an existing 1.0 meter flat bottom ditch, with 3:1 sloping and a minimum depth of 0.8 meters, located on a service corridor that flows westerly until the southwest corner of the property. It then continues to flow northerly for approximately 83.5 meters where it then changes direction and flows to the west towards Fox Road.

On the east side of the subject property, there is an existing ditch which flows southerly down Henderson Street, and outlets into the existing 1.0 meter flat bottom ditch on the south of the property.

The existing site drains via sheet flow to the existing 1.0 meter flat bottom ditch on service corridor.

Pre - Development Flows:

The allowable flows were based on criteria obtained from the Town of Port Hope during a preconsultation meeting. The design criteria provided is to control flows from the site to 17.3 l/s/ha in accordance with the *Stormwater Management and Erosion and Silt Control Report* by Aecom, (2011).

Design storm data for the Town of Port Hope*:*

5 Year storm event

$I_5 = 2464/(Tc+16)$ where: I = intensity (mm/hr.)
Tc = time of concentration (min)

100 Year storm event

$I_{100} = 5588/(Tc+28)$ where: I = intensity (mm/hr.)
Tc = time of concentration (min)

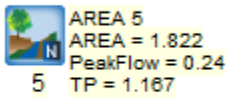
Table 7 – Allowable Discharge	
Total Area (ha)	**Q (l/s) – 17.3 l/s/ha**
1.822	**31.5**

A Visual OTTHYMO is used to for the modelling to determine the peak flows for 5- and 100-year storm events for the existing condition using NASHYD method, see the following Table 8 for the description and characteristics of the pre-development system. The pre-development discharge for 100-year storm event is 240 l/s however, the post-development discharge should be less or equal to the allowable discharge.

Table 8 – Catchment Characteristics for the Pre-Developed Site

Area No.	Area (ha)	Hydrograph Method	% impervious	imperviousness directly connected %	Loss Method for Pervious Area	CN for Pervious Area	Initial Abstraction for Pervious Area	Time to peak (T_p)
Site	1.822	NASHYD	-	-	SCS	80	5	0.20

A schematic of Visual OTTHYMO Model (100 Year Storm)-pre-development condition is shown below:



The following **Table 9** shows a summary of the peak flows from the site.

Table 9 – Summary of Flows from Site-Pre-Development Condition

Storm Event	Allowable Flow (L/s)	Pre-Development Flow (L/s)
5 Year Storm	31.5	75
100 Year Storm	31.5	240

Refer to the Visual OTTHYMO detailed output in **Appendix D** for further details.

Post - Development Flows:

For the purposes of post-development analysis, the proposed site has been divided into post-development tributary areas as shown in **Appendix D**

In order to control the post development flows to allowable flows, on-site storage by two underground storage chambers and a dry pond as well as a roof control for the 4-storey apartment building will be required. Visual OTTHYMO will be used to model and determine the detention volume required. A 0.10m (100mm) Orifice plate will be used to detain flows on site before discharging to the existing ditch on the west side of the property. This device has been chosen due to the restrictive nature of the development to maximize discharge rates vs. Head acting on the device. An orifice tube would be too restrictive or allow too much flow to pass through. To address concerns with regards to removal of the orifice plate notes have been added to the drawings and details to ensure measures are provided to prevent tapering of this device.

The stage/storage/discharge properties used to model the flow controls for this site are shown in **Appendix D.** A summary of the site storage is provided in Table 10 below.

Table 10 – Storage Summary		
Storm	Required Storage (m^3)	Provided Storage (m^3)
5 Year	**379**	**1039**
100 Year	**981**	**1039**

Visual OTTHYMO 2.3.2. will be used to model and determine the peak flows for 5- year and 100-year storm events. For drainage areas with significant imperviousness the calculation of effective rainfall in Visual OTTHYMO is accomplished using the “STANDHYD” method. This method is used in urban watersheds to simulate runoff by combining two parallel standard unit hydrographs resulting from the effective rainfall intensity over the pervious and impervious surfaces. For pervious surfaces, losses are calculated using the SCS modified CN method.

See schematic of Visual OTTHYMO Model (100 -Year Storm) below:

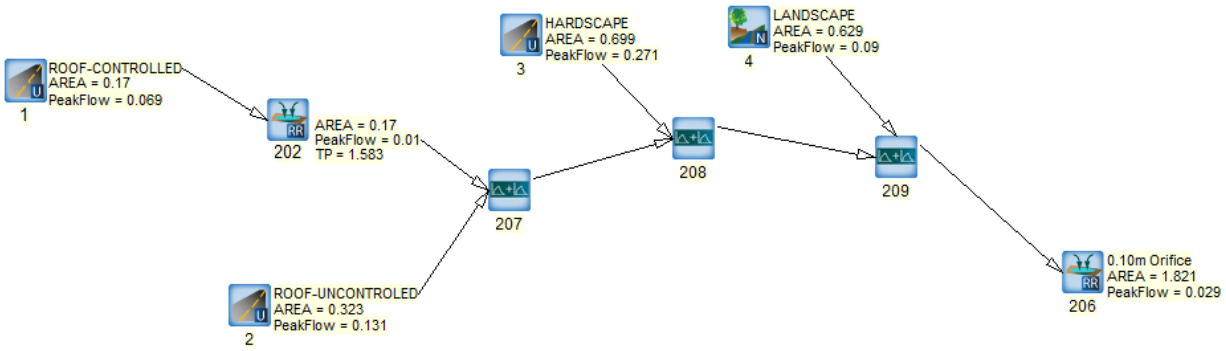


Table 11 shows the description and characteristics of the post-development system. Refer to the Visual OTTHYMO detailed output file in **Appendix D** for further details.

Table 11 – Catchment Characteristics for the Post-Developed Site

Area No.	Area (ha)	Hydrograph Method	% impervious	imperviousness directly connected %	Loss Method for Pervious Area	CN for Pervious Area	Initial Abstraction for Pervious Area	Time to peak (T_p)
Area 1- Rooftop Uncontrolled	0.17	STANDHYD	99	99	SCS	80	1	-
Area 2- Rooftop Uncontrolled	0.323	STANDHYD	99	99	SCS	80	1	-
Area 3- Hardscape	0.699	STANDHYD	90	90	SCS	80	1	-
Area 4 - Landscape	0.629	NASHYD	-	-	SCS	80	5	0.167

The following **Table 12** shows a summary of the total peak flows from the site.

Table 12 – Summary of Flows from Site

Storm Event	Allowable Flow (L/s)	Proposed Flow (L/s)
5 Year 1Storm	31.5	21
100 Year Storm	31.5	28

As can be seen the post development flow is less than the allowable flow for both the 2- and 100-year storm events, thus meeting the Town of Port Hope storm water quantity controls for the proposed development.

Water Quality:

For the purposes of zoning and based on the type of development water quality can be achieved through the use of an adequately sized Oil/Grit Separator or Oil/Grit Filtration Separator in combination with LID's and alternative means to achieve water quality.

Water Quality for the proposed development will be determined at the detailed design stage based on the above noted design principals to meet the required water quality storm events.

Based on the current site plan it is expected that a HydroDome HD 6 will meet the required 80% TSS removal.

For further detailed calculations refer to Appendix D.

4.0 EROSION CONTROL

Erosion and sediment controls for the site will be implemented according to The Ministry of Natural Resources Guidelines on Erosion and Sediment Control for Urban Construction Sites. A detailed erosion control plan is included in the set of drawings.

5.0 CONCLUSIONS

From our investigation, the site is serviceable utilizing existing sanitary, storm and watermain infrastructure adjacent to the site. The post development 2- & 100-year storm design have been maintained at the allocated flow rate for the site.

The following **Table 13** summarizes the components of the proposed development.

Table 13 – Summary Information	
Total Sanitary Flow (L/sec)	5.42
Total Water Demand : (L/sec)	151.3
Actual Flow at 20 PSI (L/sec)	210.6
Allowable release rate from site (L/sec) (100- year storm)	31.5
Actual release rate from site (L/sec) (100 year storm)	28
Total Storm Water Storage Required (m3)	967
Total Storm Water Storage Provided (m3)	1039
Quantity Control	100mm Dia. Orifice Plate
Water Quality	Oil Grit Separator HydroDome HD6

Respectfully Submitted;
The Odan/Detech Group Inc.

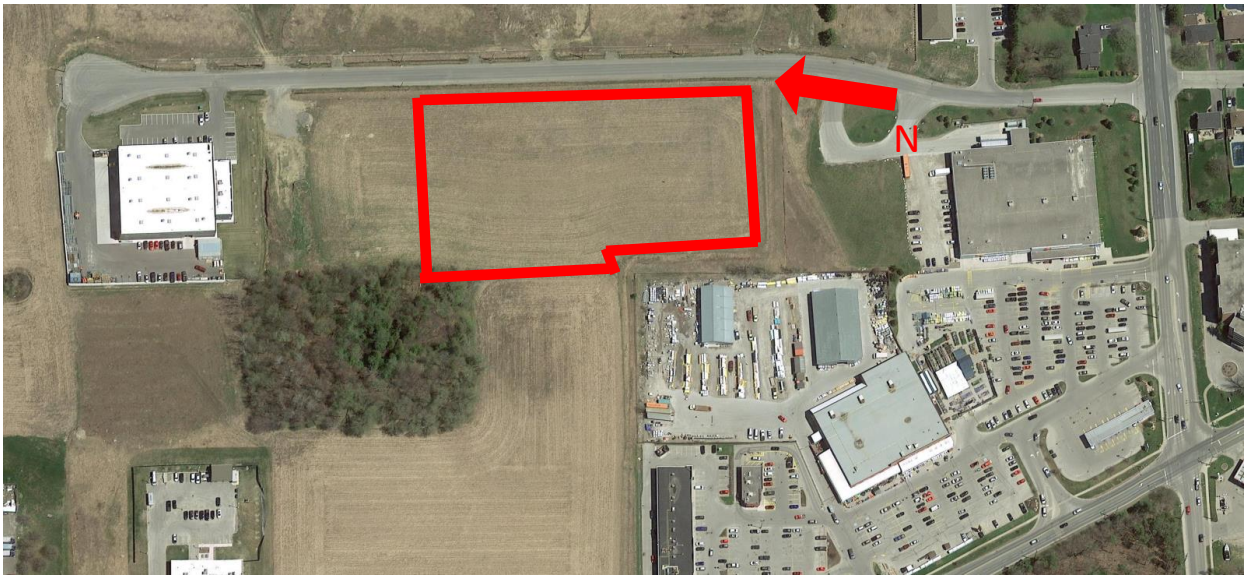
April 19 2023
Paul Hecimovic, P.Eng.

April 19 2023
Mark Harris, Dipl. Tech.

APPENDIX A

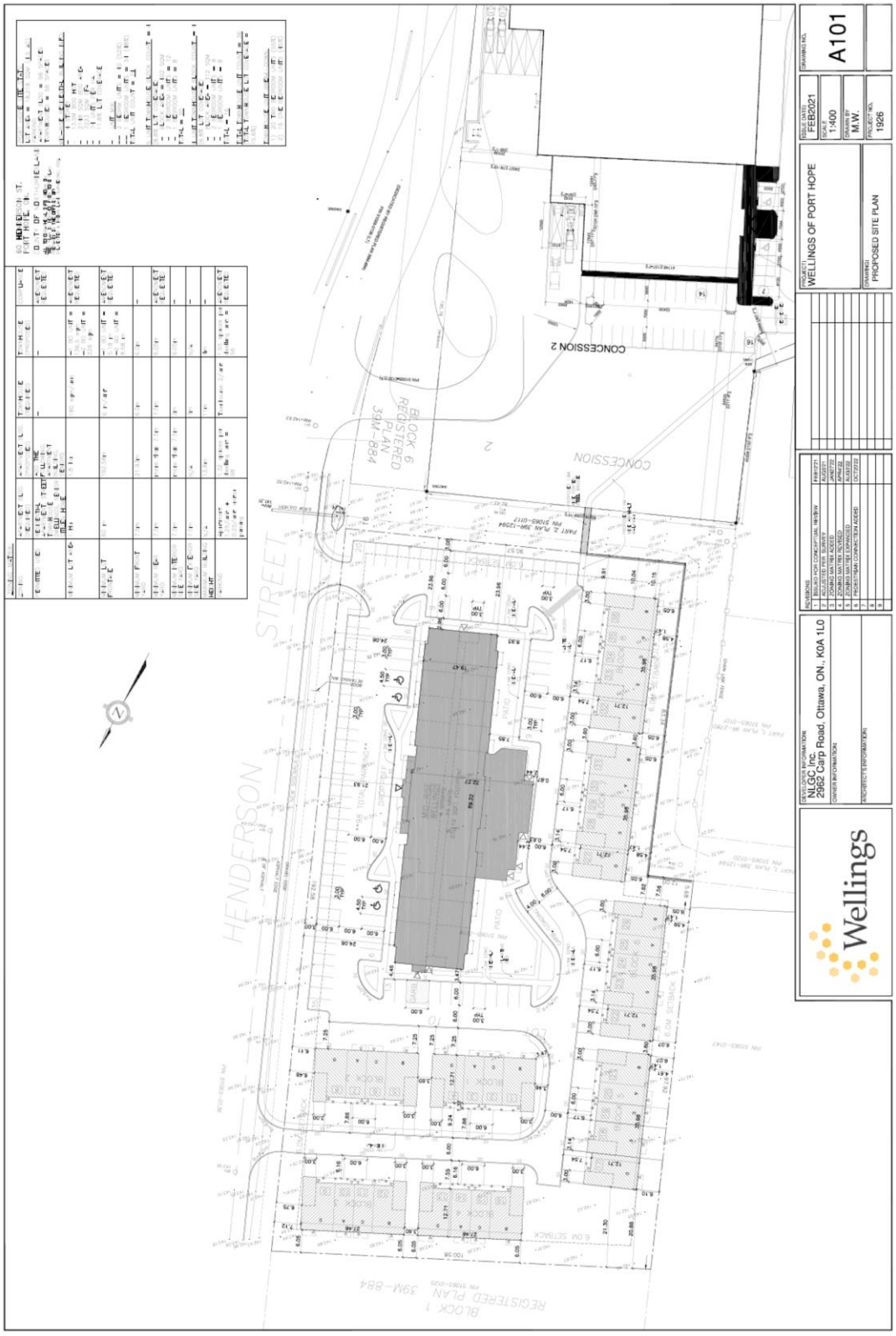
A1. Aerial Photo of Existing Site
A2. Site Plan
A3. Site Statistics
A4. Topography of Existing Site

A.1 Aerial Photo of Existing Site



Appendix A – Figure 1: Aerial Photo of Existing Site is an excerpt from Google Maps with the approximate property line shown (**red** line). For detailed information regarding the existing property line and topography site conditions, refer to the latest survey and drawings prepared by Sylvester & Brown Land Surveying Ltd., see also **Appendix A – Figure 2**.

A.2 Site Plan


HENDERSON STREET
CONCESSION 2
CONCESSION
BLOCK 6
REGISTERED PLAN 39M-884
REGISTERED PLAN 39M-884
BLOCK 1
A101
PROPOSED SITE PLAN
WELLINGS OF PORT HOPE
FEB2021
1:400
M.W.
1926
NLGO Inc.
2592 Carp Road, Ottawa, ON., K0A 1L0
Wellings

A.3 Site Statistics

PORT HOPE SITE STATS:
LOT AREA = 18,218 SQM (4.5 AC)
PARKING:
APARTMENT BLDG = 98 SPACES
TOWNHOUSES = 56 SPACES

MID-RISE RESIDENTIAL BUILDING INFO:
- 4 STOREY
- 13.5M BDG HGT.
- 2148 SQM BDG AREA
- 7223 SQM GFA
- 74 UNITS PER HA.
- 11.8% LOT COVERAGE

- UNIT MIX:
-- 2 BEDRM UNITS = 40 (52%)
-- 1 BEDROOM UNITS = 34 (48%)
TOTAL UNIT COUNT = 74

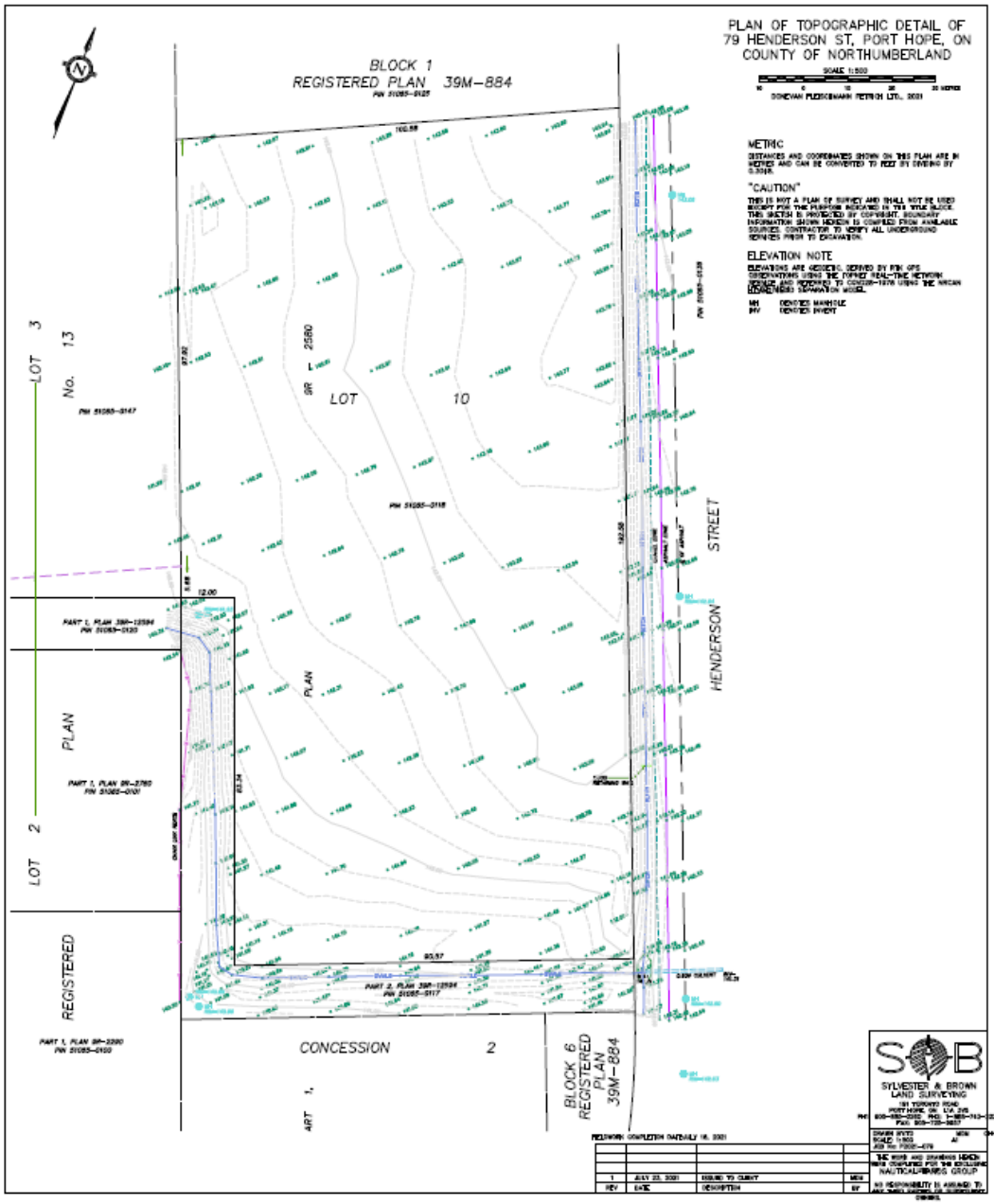
5 UNIT TOWNHOUSE BLOCK COUNT: = 4
(8.8% LOT COVERAGE)
- BLOCK AREA = 402 SQM
- 2 BEDROOM UNITS = 12
- 1 BEDROOM UNITS = 8
TOTAL = 20

4 UNIT TOWNHOUSE BLOCK COUNT: = 4
(6.8% LOT COVERAGE)
- BLOCK AREA = 312 SQM
- 2 BEDROOM UNITS = 8
- 1 BEDROOM UNITS = 8
TOTAL = 16

TOTAL TOWNHOUSE UNIT COUNT = 36
(TOTAL TOWNHOUSE LOT COVERAGE = 15.6%)

TOWNHOUSE UNIT BREAK-DOWN:
1) 20 TWO BEDROOM UNITS (55%)
2) 16 ONE BEDROOM UNITS (45%)

A.4 Topography of Existing Site



Appendix A – Figure 2: Topography of Existing Site is topography from Drawing 20-2716, dated July 23, 2021 and prepared by Sylvester & Brown Land Surveying Ltd. For detailed information regarding the existing topography site conditions, refer to the latest survey and drawings prepared by Sylvester & Brown Land Surveying Ltd.

APPENDIX B

SANITARY FLOW CALCULATIONS

SANITARY FLOW CALCULATIONS

SCENERIO: Proposed/Existing Development

This program calculates the sanitary discharge from various land use

As per the City of Toronto Guidelines

FILL IN COLOURED CELLS AS REQUIRED

TOTAL SITE AREA (ha) = 1.822

LAND USE	NUMBER OF UNITS	SITE AREA, (ha)	GROSS FLOOR AREA, m2	TOTAL POPULATION	TOTAL DAILY FLOW (LITERS)	AVERAGE DAILY FLOW l/sec	PEAKING FACTOR, M	TOTAL FLOW FROM LAND USE, l/sec
RESIDENTIAL EX 1 Bedroom, using 1.4 persons/unit	0			0	0	0.00		
RESIDENTIAL PROP 1 Bedroom, using 1.4 persons/unit	34			48	21420	0.25		
RESIDENTIAL EX 2 Bedroom, using 2.1 persons/unit	0			0	0	0.00		
RESIDENTIAL PROP 2 Bedroom, using 2.1 persons/unit	40			84	37800	0.44		
RESIDENTIAL EX 3 Bedroom using 3.1 persons/unit	0			0	0	0.00		
RESIDENTIAL PROP 3 Bedroom using 3.1 persons/unit	0			0	0	0.00		
RESIDENTIAL EX Townhouse using 2.7persons/unit	0			0	0	0.00		
RESIDENTIAL PROP TH using 2.7persons/unit	36			97	43740	0.51		
Total Residential	110			229	102960	1.19	4.13	4.92
COMMERCIAL, Using 100 persons/ha	0			0				
COMMERCIAL, Using 1.1 persons/100 m2	0			0				
OFFICES, Using, 3.3 persons/100m2	0			0				
Total ICI	0	0.00			0	0.00		0.00

P=	229			
TOTAL V1=	102960	Q1=	4.92	
		Q2=	0.00	
Q = (MqP/86400) + A * I (L/sec)		Qinfil	0.47	
		Qtot	5.39	

Q1= total flow from Residential Land Use (L/sec)
Q2= total flow from Commercial Land Use (L/sec)
Qinfil = total flow from infiltration (L/sec)
Qtot = total flow (Land use + infiltration)

V1= Total Volume from Land Use in liters

where :

P is population
q = 240 L/cap/day (Ex Residential)
q = 250 L/cap/day (Ex Commerical/Office)
q = 450 L/cap/day (Proposed)

A = gross site area
i = 0.26 L/sec/ha (infiltration rate)
Peaking Factor M = 1 + [14 / (4 + (P/1000,1/2))]

APPENDIX C

FUS CALCULATION SHEET

OBC CALCULATION by JSCI

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$

Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	79 Henderson Street, Port Hope			**PROJECT:**	4 Storey Mid rise building		
OBC OCCUPANCY:	Residential			**PROJECT No:**	21241 (PH)		
BUILDING FOOT PRINT (m2):	2121						
# OF STOREYS	4						
CONSTRUCTION CLASS:	Wood Frame						
AUTOMATED SPRINKLER PROTECTION		Credit	Total				
NFPA 13 sprinkler standard	Yes	30%	50%				
Standard Water Supply	Yes	10%					
Fully Supervised System	Yes	10%					
		50%					
CONTENTS FACTOR:	Limited Combustible			CHARGE:	-15%		

Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

EXPOSURE 1 (south)	Distance to Exposure Building (m)	>45	0	
	Length - Height			
EXPOSURE 2 (east)	Distance to Exposure Building (m)	>45	0	
	Length - Height			
EXPOSURE 3 (west)	Distance to Exposure Building (m)	14.3	15	
	Length - Height			
EXPOSURE 4 (north)	Distance to Exposure Building (m)	21.7	10	
	Length - Height			
		Total:	25	no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

ARE BUILDINGS CONTIGUOUS:	NO					
FIRE RESISTANT BUILDING	Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?					NO
CALCULATIONS	*C =*	1.5		Wood Frame		
	A =	7153	m2	Total		STOREY AREAS m2
	F =	27909	L/min			2121 1
Round to Nearest 1000 L/min	F =	28000	L/min	must be > 2000 L/min		1677 2
						1677 3
CORRECTION FACTORS:						1677 4
OCCUPANCY		-4200	L/min			
FIRE FLOW ADJUSTED FOR OCCUPANCY		23800	L/min			
REDUCTION FOR SPRINKLER		-11900	L/min			
EXPOSURE CHARGE		5950	L/min			
REQUIRED FIRE FLOW	**F =**	17850	L/min			
Round to Nearest 1000 L/min	**F =**	18000	L/min	4755	usgm	
	F =	300	L/sec			

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

F = 220 x C x √ A
Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	79 Henderson Street, Port Hope			**PROJECT:**	4 Unit Block		
OBC OCCUPANCY:	Residential			**PROJECT No:**	21241 (PH)		
BUILDING FOOT PRINT (m2):	312						
# OF STOREYS	1						
CONSTRUCTION CLASS:	Wood Frame						
AUTOMATED SPRINKLER PROTECTION		Credit	Total				
NFPA 13 sprinkler standard	No	0%	0%				
Standard Water Supply	No	0%					
Fully Supervised System	No	0%					
		0%					
CONTENTS FACTOR:	Limited Combustible			CHARGE:	-15%		
EXPOSURE 1 (south)	Distance to Exposure Building (m)			22.6	10		
	Length - Height						
EXPOSURE 2 (east)	Distance to Exposure Building (m)			>45	0		
	Length - Height						
EXPOSURE 3 (west)	Distance to Exposure Building (m)			3.6	20		
	Length - Height						
EXPOSURE 4 (north)	Distance to Exposure Building (m)			>45	0		
	Length - Height						
				Total:	30	no more than 75%	
ARE BUILDINGS CONTIGUOUS:	NO						
FIRE RESISTANT BUILDING	Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?						
CALCULATIONS	*C =*	1.5		Wood Frame			
	A =	312	m2	Total			
	F =	5829	L/min				
Round to Nearest 1000 L/min	F =	6000	L/min	must be > 2000 L/min			
CORRECTION FACTORS:							
OCCUPANCY		-900	L/min				
FIRE FLOW ADJUSTED FOR OCCUPANCY		5100	L/min				
REDUCTION FOR SPRINKLER		0	L/min				
EXPOSURE CHARGE		1530	L/min				
REQUIRED FIRE FLOW	**F =**	6630	L/min				
Round to Nearest 1000 L/min	**F =**	7000	L/min	1849	usgm		
	F =	117	L/sec				

Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

NO

STOREY AREAS m2	
312	1
0	
0	
0	

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$

Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	79 Henderson Street, Port Hope			**PROJECT:**	4 Unit Block
OBC OCCUPANCY:	Residential			**PROJECT No:**	21241 (PH)
BUILDING FOOT PRINT (m2):	312				
# OF STOREYS	1				
CONSTRUCTION CLASS:	Wood Frame				

Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

AUTOMATED SPRINKLER PROTECTION		Credit	Total
NFPA 13 sprinkler standard	No	0%	0%
Standard Water Supply	No	0%	
Fully Supervised System	No	0%	
		0%	

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

CONTENTS FACTOR:	Limited Combustible	CHARGE:	-15%

EXPOSURE 1 (south)	Distance to Exposure Building (m)	22.6	10	no more than 75%
	Length - Height			
EXPOSURE 2 (east)	Distance to Exposure Building (m)	3.6	20	
	Length - Height			
EXPOSURE 3 (west)	Distance to Exposure Building (m)	20.9	10	
	Length - Height			
EXPOSURE 4 (north)	Distance to Exposure Building (m)	>45	0	
	Length - Height			
		Total:	40	

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

ARE BUILDINGS CONTIGUOUS:	NO

FIRE RESISTANT BUILDING	Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?	NO

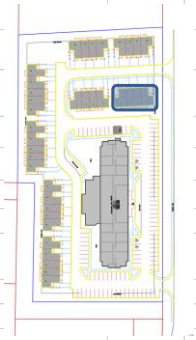
CALCULATIONS						STOREY AREAS m2	
	C =	1.5		Wood Frame			
	A =	312	m2	Total			
	F =	5829	L/min			312	1
Round to Nearest 1000 L/min	F =	6000	L/min	must be > 2000 L/min		0	
						0	
CORRECTION FACTORS:						0	
OCCUPANCY		-900	L/min				
FIRE FLOW ADJUSTED FOR OCCUPANCY		5100	L/min				
REDUCTION FOR SPRINKLER		0	L/min				
EXPOSURE CHARGE		2040	L/min				
REQUIRED FIRE FLOW	**F =**	7140	L/min				
Round to Nearest 1000 L/min	**F =**	7000	L/min	1849	usgm		
	F =	117	L/sec				

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$

Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	79 Henderson Street, Port Hope			**PROJECT:**	4 Unit Block
OBC OCCUPANCY:	Residential			**PROJECT No:**	21241 (PH)
BUILDING FOOT PRINT (m2):	312				
# OF STOREYS	1				
CONSTRUCTION CLASS:	Wood Frame				



AUTOMATED SPRINKLER PROTECTION		Credit	Total
NFPA 13 sprinkler standard	No	0%	0%
Standard Water Supply	No	0%	
Fully Supervised System	No	0%	
		0%	

CONTENTS FACTOR:	Limited Combustible	CHARGE:	-15%

EXPOSURE 1 (south)	Distance to Exposure Building (m)	21.8	10
	Length - Height		
EXPOSURE 2 (east)	Distance to Exposure Building (m)	>45	0
	Length - Height		
EXPOSURE 3 (west)	Distance to Exposure Building (m)	3.6	20
	Length - Height		
EXPOSURE 4 (north)	Distance to Exposure Building (m)	22.6	10
	Length - Height		
		Total:	40

no more than 75%

ARE BUILDINGS CONTIGUOUS:	NO

FIRE RESISTANT BUILDING	Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?	NO

CALCULATIONS						
	C =	1.5		Wood Frame		
	A =	312	m2	Total		
	F =	5829	L/min			
Round to Nearest 1000 L/min	F =	6000	L/min	must be > 2000 L/min		
CORRECTION FACTORS:						
OCCUPANCY		-900	L/min			
FIRE FLOW ADJUSTED FOR OCCUPANCY		5100	L/min			
REDUCTION FOR SPRINKLER		0	L/min			
EXPOSURE CHARGE		2040	L/min			
REQUIRED FIRE FLOW	**F =**	7140	L/min			
Round to Nearest 1000 L/min	**F =**	7000	L/min	1849	usgm	
	F =	117	L/sec			

Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

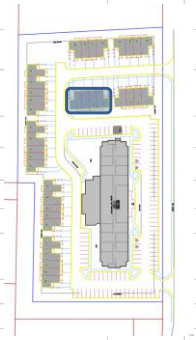
STOREY AREAS m2	
312	1
0	
0	
0	

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$

Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	79 Henderson Street, Port Hope			**PROJECT:**	4 Unit Block
OBC OCCUPANCY:	Residential			**PROJECT No:**	21241 (PH)
BUILDING FOOT PRINT (m2):	312				
# OF STOREYS	1				
CONSTRUCTION CLASS:	Wood Frame				
AUTOMATED SPRINKLER PROTECTION		Credit	Total		
NFPA 13 sprinkler standard	No	0%	0%		
Standard Water Supply	No	0%			
Fully Supervised System	No	0%			
		0%			
CONTENTS FACTOR:	Limited Combustible			CHARGE:	-15%



Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

EXPOSURE 1 (south)	Distance to Exposure Building (m)	23.0	10	
	Length - Height			
EXPOSURE 2 (east)	Distance to Exposure Building (m)	3.6	20	
	Length - Height			
EXPOSURE 3 (west)	Distance to Exposure Building (m)	16.8	15	
	Length - Height			
EXPOSURE 4 (north)	Distance to Exposure Building (m)	22.6	10	
	Length - Height			
		Total:	55	no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

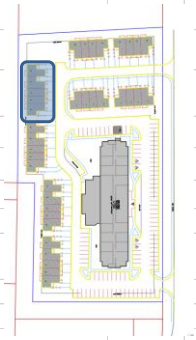
ARE BUILDINGS CONTIGUOUS:	NO					
FIRE RESISTANT BUILDING	Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?					NO
CALCULATIONS	*C =*	1.5		Wood Frame		
	A =	312	m2	Total		STOREY AREAS m2
	F =	5829	L/min			312 | 1
Round to Nearest 1000 L/min	F =	6000	L/min	must be > 2000 L/min		0
						0
CORRECTION FACTORS:						0
OCCUPANCY		-900	L/min			
FIRE FLOW ADJUSTED FOR OCCUPANCY		5100	L/min			
REDUCTION FOR SPRINKLER		0	L/min			
EXPOSURE CHARGE		2805	L/min			
REQUIRED FIRE FLOW	**F =**	7905	L/min			
Round to Nearest 1000 L/min	**F =**	8000	L/min	2113	usgm	
	F =	133	L/sec			

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$

Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	79 Henderson Street, Port Hope			**PROJECT:**	5 Unit Block
OBC OCCUPANCY:	Residential			**PROJECT No:**	21241 (PH)
BUILDING FOOT PRINT (m2):	402				
# OF STOREYS	1				
CONSTRUCTION CLASS:	Wood Frame				
AUTOMATED SPRINKLER PROTECTION		Credit	Total		
NFPA 13 sprinkler standard	No	0%	0%		
Standard Water Supply	No	0%			
Fully Supervised System	No	0%			
		0%			
CONTENTS FACTOR:	Limited Combustible			CHARGE:	-15%



Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

EXPOSURE 1 (south)	Distance to Exposure Building (m)	3.6	20	
	Length - Height			
EXPOSURE 2 (east)	Distance to Exposure Building (m)	16.8	15	
	Length - Height			
EXPOSURE 3 (west)	Distance to Exposure Building (m)	>45	0	
	Length - Height			
EXPOSURE 4 (north)	Distance to Exposure Building (m)	>45	0	
	Length - Height			
		Total:	35	no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

ARE BUILDINGS CONTIGUOUS: NO

FIRE RESISTANT BUILDING Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating? NO

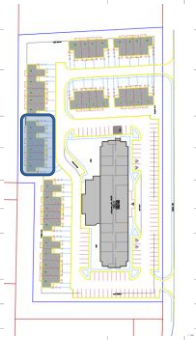
CALCULATIONS						STOREY AREAS m2	
	C =	1.5		Wood Frame			
	A =	402	m2	Total			
	F =	6616	L/min			402	1
Round to Nearest 1000 L/min	F =	7000	L/min	must be > 2000 L/min		0	
						0	
CORRECTION FACTORS:						0	
OCCUPANCY		-1050	L/min				
FIRE FLOW ADJUSTED FOR OCCUPANCY		5950	L/min				
REDUCTION FOR SPRINKLER		0	L/min				
EXPOSURE CHARGE		2082.5	L/min				
REQUIRED FIRE FLOW	**F =**	8033	L/min				
Round to Nearest 1000 L/min	**F =**	8000	L/min	2113	usgm		
	F =	133	L/sec				

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$

Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	79 Henderson Street, Port Hope			**PROJECT:**	5 Unit Block
OBC OCCUPANCY:	Residential			**PROJECT No:**	21241 (PH)
BUILDING FOOT PRINT (m2):	402				
# OF STOREYS	1				
CONSTRUCTION CLASS:	Wood Frame				
AUTOMATED SPRINKLER PROTECTION		Credit	Total		
NFPA 13 sprinkler standard	No	0%	0%		
Standard Water Supply	No	0%			
Fully Supervised System	No	0%			
		0%			
CONTENTS FACTOR:	Limited Combustible			CHARGE:	-15%



Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

EXPOSURE 1 (south)	Distance to Exposure Building (m)	7.3	20	
	Length - Height			
EXPOSURE 2 (east)	Distance to Exposure Building (m)	29.6	10	
	Length - Height			
EXPOSURE 3 (west)	Distance to Exposure Building (m)	>45	0	
	Length - Height			
EXPOSURE 4 (north)	Distance to Exposure Building (m)	3.6	20	
	Length - Height			
		Total:	50	no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

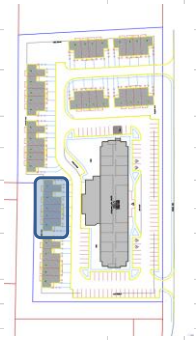
ARE BUILDINGS CONTIGUOUS:	NO					
FIRE RESISTANT BUILDING	Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?					NO
CALCULATIONS	*C =*	1.5		Wood Frame		
	A =	402	m2	Total		STOREY AREAS m2
	F =	6616	L/min			402 | 1
Round to Nearest 1000 L/min	F =	7000	L/min	must be > 2000 L/min		0
						0
CORRECTION FACTORS:						0
OCCUPANCY		-1050	L/min			
FIRE FLOW ADJUSTED FOR OCCUPANCY		5950	L/min			
REDUCTION FOR SPRINKLER		0	L/min			
EXPOSURE CHARGE		2975	L/min			
REQUIRED FIRE FLOW	**F =**	8925	L/min			
Round to Nearest 1000 L/min	**F =**	9000	L/min	2378	usgm	
	F =	150	L/sec			

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$

Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	79 Henderson Street, Port Hope			**PROJECT:**	5 Unit Block
OBC OCCUPANCY:	Residential			**PROJECT No:**	21241 (PH)
BUILDING FOOT PRINT (m2):	402				
# OF STOREYS	1				
CONSTRUCTION CLASS:	Wood Frame				
AUTOMATED SPRINKLER PROTECTION		Credit	Total		
NFPA 13 sprinkler standard	No	0%	0%		
Standard Water Supply	No	0%			
Fully Supervised System	No	0%			
		0%			
CONTENTS FACTOR:	Limited Combustible			CHARGE:	-15%



Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

EXPOSURE 1 (south)	Distance to Exposure Building (m)	3.6	20	
	Length - Height			
EXPOSURE 2 (east)	Distance to Exposure Building (m)	14.2	15	
	Length - Height			
EXPOSURE 3 (west)	Distance to Exposure Building (m)	> 45	0	
	Length - Height			
EXPOSURE 4 (north)	Distance to Exposure Building (m)	7.3	20	
	Length - Height			
		Total:	55	no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

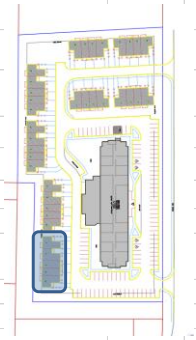
ARE BUILDINGS CONTIGUOUS:	NO					
FIRE RESISTANT BUILDING	Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?					NO
CALCULATIONS	*C =*	1.5		Wood Frame		
	A =	402	m2	Total		STOREY AREAS m2
	F =	6616	L/min			402 | 1
Round to Nearest 1000 L/min	F =	7000	L/min	must be > 2000 L/min		0
						0
CORRECTION FACTORS:						0
OCCUPANCY		-1050	L/min			
FIRE FLOW ADJUSTED FOR OCCUPANCY		5950	L/min			
REDUCTION FOR SPRINKLER		0	L/min			
EXPOSURE CHARGE		3272.5	L/min			
REQUIRED FIRE FLOW	**F =**	9223	L/min			
Round to Nearest 1000 L/min	**F =**	9000	L/min	2378	usgm	
	F =	150	L/sec			

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$

Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	79 Henderson Street, Port Hope			**PROJECT:**	5 Unit Block
OBC OCCUPANCY:	Residential			**PROJECT No:**	21241 (PH)
BUILDING FOOT PRINT (m2):	402				
# OF STOREYS	1				
CONSTRUCTION CLASS:	Wood Frame				
AUTOMATED SPRINKLER PROTECTION		Credit	Total		
NFPA 13 sprinkler standard	No	0%	0%		
Standard Water Supply	No	0%			
Fully Supervised System	No	0%			
		0%			
CONTENTS FACTOR:	Limited Combustible			CHARGE:	-15%



Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

EXPOSURE 1 (south)	Distance to Exposure Building (m)	> 45	0	
	Length - Height			
EXPOSURE 2 (east)	Distance to Exposure Building (m)	27.7	10	
	Length - Height			
EXPOSURE 3 (west)	Distance to Exposure Building (m)	26.8	10	
	Length - Height			
EXPOSURE 4 (north)	Distance to Exposure Building (m)	3.6	20	
	Length - Height			
		Total:	40	no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

ARE BUILDINGS CONTIGUOUS:	NO					
FIRE RESISTANT BUILDING	Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?					NO
CALCULATIONS	*C =*	1.5		Wood Frame		
	A =	402	m2	Total		STOREY AREAS m2
	F =	6616	L/min			402 1
Round to Nearest 1000 L/min	F =	7000	L/min	must be > 2000 L/min		0
						0
CORRECTION FACTORS:						0
OCCUPANCY		-1050	L/min			
FIRE FLOW ADJUSTED FOR OCCUPANCY		5950	L/min			
REDUCTION FOR SPRINKLER		0	L/min			
EXPOSURE CHARGE		2380	L/min			
REQUIRED FIRE FLOW	**F =**	8330	L/min			
Round to Nearest 1000 L/min	**F =**	8000	L/min	2113	usgm	
	F =	133	L/sec			

Jain

Jan. 17, 2022

Re: 500 Holland Street W., Bradford ON.
Fire Protection Water Supply Requirement for Part 3 of O.B.C.

The proposed commercial building at 500 Holland Street W., Bradford ON. is a Seniors apartment building. The entire building is of combustible construction, sprinklered.

The site and building is serviced by municipal water supply (Water flow and pressure test attached)

Existing Site (attached)

The Subject Site is located on the (short description of site and surrounding areas)

To the North: Vacant Land
To the East: Existing Grocery Store
To the West: Langford Blvd
To the South: Miller Park Ave

Calculation: Q=KVStot

K: building construction classification

V: building volume

Stot: building property line distances

Stot = 1+ Σ Stot

Building classifications by group:

Apartment Building: C (K=18)

Building Volume:

24,625 m³

Building multiple exposures:

18.1 m; Stot = 0

27.6 m; Stot =0

3.0 m1.5m, Stot=0.5

26.5 m, Stot = 0

Stot = 1+0+0+0.5+0

Jain Sustainability Consultants Inc.
7405 East Danbro Crescent,
Mississauga, Ontario, L5N 6P8 Canada

(905) 285-9900
(905) 567-5246
mail@jainconsultants.com
www. jainconsultants.com

thinking globally, delivering locally

Q=18 x 24,626 m³ x 1.5

Q=664,902 m³

According to Fire protection Water Supply guideline for Part 3 of OBC A3.2.5.7, Table 2:

Minimum water supply flow rate for Q≥270,000

Required water supply shall be 9000 L/min (150 L/sec)

Conclusion:

Municipal water supply graph shows sufficient flow and pressure used for sprinkler and inside and outside hose stream requirement as referenced by Article 3.2.5.13 of the Building Code and NFPA 13.

Yours very truly,

D. Jain, M.Eng., M.B.A., P.Eng., C.E.M., L.A.P.

Enclosures

1. Site Plan
2. Water flow and pressure test

FLOWMETRIX
INDU-TECH
PROCESS

Fire Flow Testing Report

Residual Hydrant #	HY
NFPA Colour Code	BLUE

DATE: January 25, 2022
TIME: 10:00 AM

ADDRESS: 79 Henderson Street, Port Hope, ON L1A 2G3

CONTACT INFO: Angela Mariani, Nautical Lands Group, T: (905) 683-1261, E: angela@nlgc.comm

RESIDUAL HYDRANT INFO.

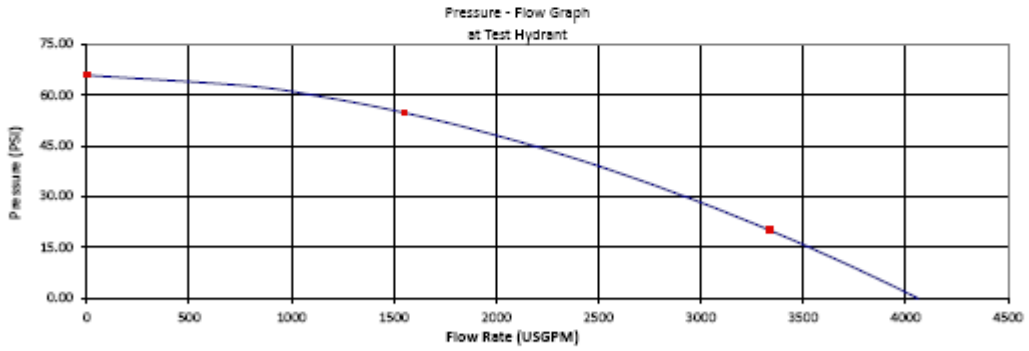
HYDRANT #	HY	
N.F.P.A. COLOUR CODE	BLUE	
STATIC PRESSURE	65.9	psi
RESIDUAL PRESSURE	54.8	psi
PRESSURE DROP	11.1	psi
% PRESSURE DROP	16.8	% psi

Flow on Water Main At Test Hydrant - 20 psi 3338 USGPM

FLOW HYDRANT(S) INFO.

HYDRANT ASSET ID	HYD. # PORTS	OUTLET DIAMETER (INCHES)	NOZZLE COEFFICIENT	DIFFUSER TYPE	DIFFUSER COEFFICIENT	PITOT READING (psi)	PITOT FLOW (USGPM)	FLOW METER (USGPM)
HY	2	2.5	Round	LPD250	0.90	26.3	775	0
		2.5	Round	LPD250	0.90	26.3	775	0
					Total Flow (USGPM)		1549	0
					Total Flow (USGPM)		1549	

FIRE FLOW CHART

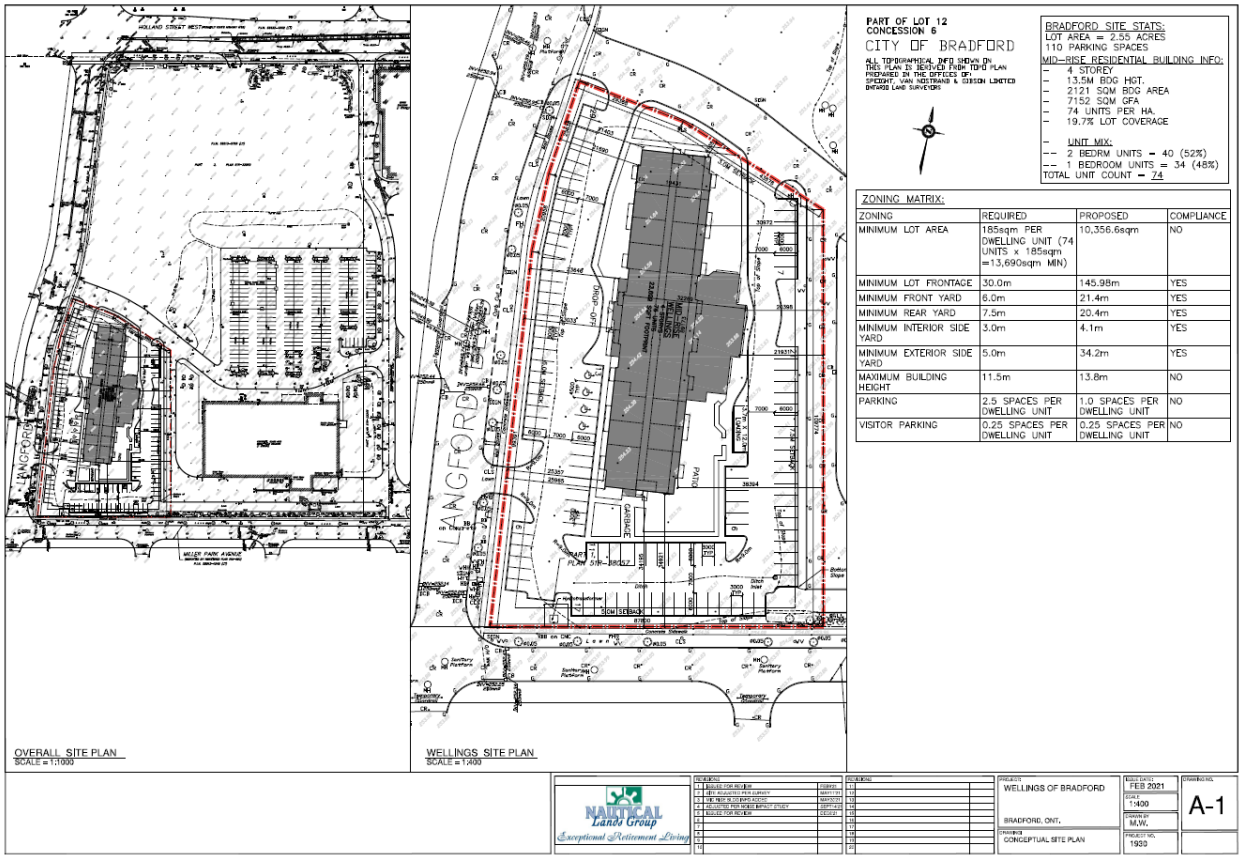


COMMENTS

OPERATOR	FMX	Ryan Ritchie
OPERATOR	FMX	
OPERATOR		Port Hope Municipality

Copy of NauticalLandsGroup_FireFlowTesting_HendersonSt_PortHope

"If we don't measure it, how do you manage it?"


PART OF LOT 12
CONCESSION 6
CITY OF BRADFORD
ALL TOPOGRAPHICAL INFO SHOWN ON THIS PLAN IS BASED ON TOPO PLAN PREPARED IN THE OFFICES OF: SPEIGHT, VAN NOSTRAND & GIBSON LIMITED ONTARIO LAND SURVEYORS
BRADFORD SITE STATS:
LOT AREA = 2.55 ACRES
110 PARKING SPACES
MID-RISE RESIDENTIAL BUILDING INFO:
- 4 STOREY
- 13.5M BDG HGT.
- 2121 SQM BDG AREA
- 7152 SQM GFA
- 74 UNITS PER HA.
- 19.7% LOT COVERAGE
- UNIT MIX:
-- 2 BEDRM UNITS = 40 (52%)
-- 1 BEDROOM UNITS = 34 (48%)
TOTAL UNIT COUNT = 74
ZONING MATRIX:
ZONING | REQUIRED | PROPOSED | COMPLIANCE
MINIMUM LOT AREA | 185sqm PER DWELLING UNIT (74 UNITS x 185sqm =13,690sqm MIN) | 10,356.6sqm | NO
MINIMUM LOT FRONTAGE | 30.0m | 145.98m | YES
MINIMUM FRONT YARD | 6.0m | 21.4m | YES
MINIMUM REAR YARD | 7.5m | 20.4m | YES
MINIMUM INTERIOR SIDE YARD | 3.0m | 4.1m | YES
MINIMUM EXTERIOR SIDE YARD | 5.0m | 34.2m | YES
MAXIMUM BUILDING HEIGHT | 11.5m | 13.8m | NO
PARKING | 2.5 SPACES PER DWELLING UNIT | 1.0 SPACES PER DWELLING UNIT | NO
VISITOR PARKING | 0.25 SPACES PER DWELLING UNIT | 0.25 SPACES PER DWELLING UNIT | NO
OVERALL SITE PLAN
SCALE = 1:1000
WELLINGS SITE PLAN
SCALE = 1:400
NAUTICAL Land Group
Exceptional Retirement Living
WELLINGS OF BRADFORD
BRADFORD, ONT.
CONCEPTUAL SITE PLAN
FEB 2021
1:400
M.W.
1933
A-1

APPENDIX D

PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN

POST-DEVELOPMENT STORM DRAINAGE AREA PLAN

STAGE/STORAGE/DISCHARGE CALCULATION SHEETS

CULTEC DESIGN SHEET

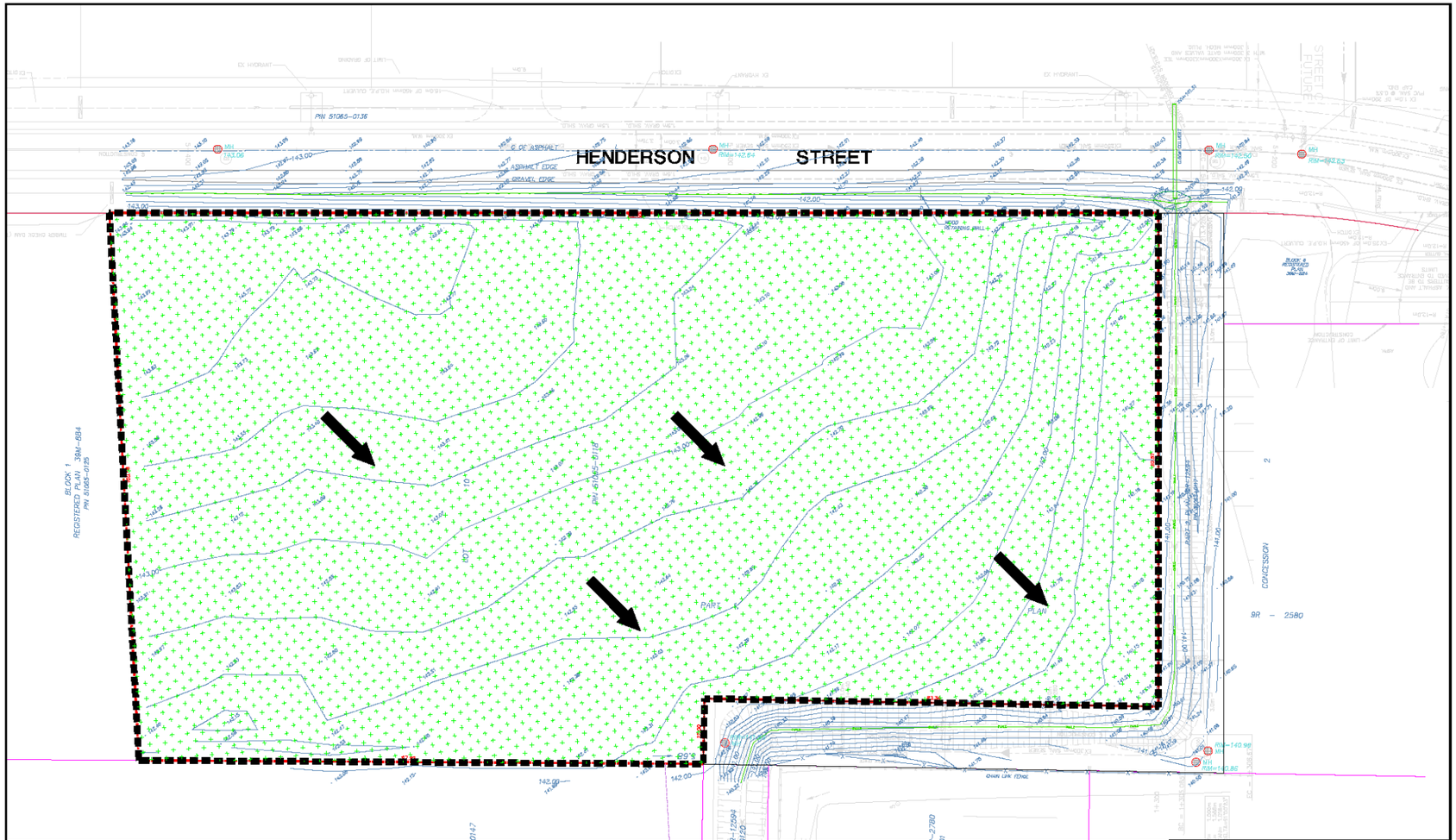
VISUAL OTTHYMO MODEL-Pre-Development

VISUAL OTTHYMO OUTPUT-Pre-Development

VISUAL OTTHYMO MODEL-Post-Development

VISUAL OTTHYMO OUTPUT-Post-Development

OGS SIZING


HENDERSON STREET
LEGEND
LANDSCAPE AREA (1.822 ha)
CATCHMENT BOUNDARY
EMERGENCY OVERLAND FLOW PATH
DRAWING :
PRE-DEVELOPMENT FIGURE
DATE:
NOVEMBER 2021
PROJ. NO.:
21241
SCALE:
1:1000
PROJECT :
RESIDENTIAL DEVELOPMENT
79 HENDERSON STREET
PORT HOPE, ONTARIO
ODAN·DETECH
CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

LEGEND

- AREA 1 & 2 — ROOF AREA (0.493 ha)
- AREA 3 — HARDSCAPE AREA (0.699 ha)
- AREA 4 — LANDSCAPE AREA (0.629 ha)
- EMERGENCY OVERLAND FLOW PATH
- CATCHMENT BOUNDARY

DRAWING :

POST-DEVELOPMENT FIGURE

DATE:	PROJ. NO.:	SCALE:
NOVEMBER 2021	21241	1:1000

PROJECT :

RESIDENTIAL DEVELOPMENT
60 HENDERSON STREET
PORT HOPE, ONTARIO

ODAN·DETECH
CONSULTING ENGINEERS

ORIFICE DISCHARGE CALCULATOR

This program calculates the discharge from a circular orifice when given elevations and orifice diameters by the user.

Discharge based on orifice equ.: Q = CA x sqrt(2gh)

Orifice Diameter = **0.100** m ← **Enter the orifice diameter in metres**

Area **0.00785** m2

Discharge Coeff. = **0.610** ← **Enter discharge coeff. to use**

Orifice Plate

Elev.	Head (m)	Q (m3/s)	Cultec (m3)	Pond (m3)	Pipes & Structures	Total Storage(m3)
140.56	0	0.0000	0.0	0.0	0.0	0.0
141.14	0.58	0.0162	25.3	76.2	0.0	101.5
141.20	0.64	0.0170	41.6	76.2	0.0	117.8
141.40	0.84	0.0194	105.4	149.7	0.0	255.1
141.60	1.04	0.0216	165.4	228.5	0.0	393.9
141.80	1.24	0.0236	219.4	312.5	159.5	691.4
142.00	1.44	0.0255	260.1	402.2	159.5	821.8
142.20	1.64	0.0272	292.5	497.7	159.5	949.7
142.40	1.84	0.0288	280.7	599.2	159.5	1039.4

CULTEC Stormwater Design Calculator

Please Fill in the Shaded Cells

Project Information:

Project Name	
Address	
City	
State/Province	
ZIP/Postal Code	
Country	

Calculations Performed By:

Name	
Company Name	
Address	
City	
State/Province	
ZIP/Postal Code	
Country	
Phone	
Email	

Date: April 19, 2023

Project Number:

Input Project Requirements

Unit of Measure	**Metric**	
Select Model	Recharger 360HD	
Stone Porosity	40%	
Number of HVLV Internal Manifolds	2 Internal Manifolds	
Stone Depth **Above** Chamber	305	mm
Stone Depth **Below** Chamber	229	mm
Stone **Between** Chamber rows	300	mm
☐ Include Separator Row		
Workable Bed Depth	2.06	meters
Max. Bed Width	40.00	meters
Storage Volume Required	330.00	cu. meters
Stone Base Elevation	140.84	meters

GET REPORT

Additional Information:

Other models are available if products above do not meet your requirements. Contact CULTEC for further design assistance.
Call CULTEC at 203-775-4416 for pricing information.

Hyperlinks to product specific webpages:

Please visit our website for more information such as CAD details, spec information, brochures, installation instructions, and other design tools on certain models.

Contactor Field Drain C-4HD
Contactor 100HD
Recharger 150XLHD
Recharger 180HD
Recharger 280HD
Recharger 330XLHD
Recharger 360HD
Recharger 902HD
HVLV SFCx2 Feed Connector
HVLV FC-24 Feed Connector
HVLV FC-48 Feed Connector
CULTEC No. 4800 Woven Geotextile
CULTEC No. 410 Non-Woven Geotextile

For design assistance, drawings and pricing send these calculations to:
mailto:tech@cultec.com

Website:
www.cultec.com

CULTEC Stormwater Design Calculator

Date:	April 19, 2023

Project Information:

21241 - PORT HOPE

INPUT INFO

Calculations Performed By:

Odan Detech

RECHARGER 360HD

Recharger 360HD Chamber Specifications		
Height	**914**	mm
Width	**1524**	mm
Length	**1.27**	meters
Installed Length	**1.12**	meters
Bare Chamber Volume	**1.04**	cu. meters
Installed Chamber Volume	**1.81**	cu. meters

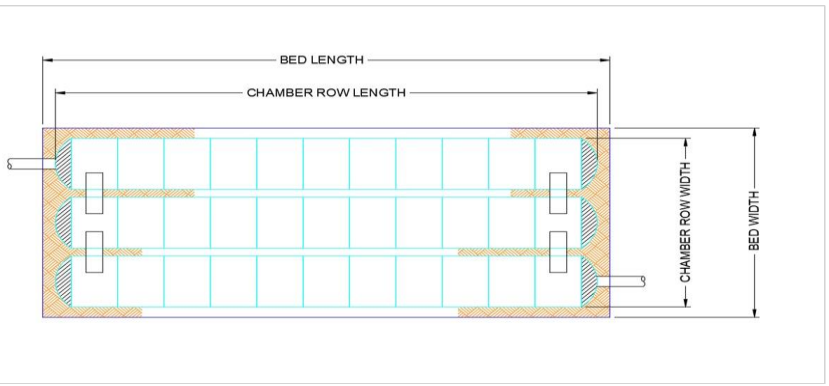
Breakdown of Storage Provided by Recharger 360HD Stormwater System		
Within Chambers	**182.23**	cu. meters
Within Feed Connectors	**1.03**	cu. meters
Within Stone	**158.05**	cu. meters
Total Storage Provided	**341.3**	**cu. meters**
Total Storage Required	330.00	cu. meters

Materials List

Recharger 360HD		
Total Number of Chambers Required	**168**	**pieces**
Chamber Units	**168**	pieces
End Caps	**42**	pieces
HVLV FC-48 Feed Connectors	**40**	pieces
CULTEC No. 410 Non-Woven Geotextile	**1176**	sq. meters
CULTEC No. 4800 Woven Geotextile	**77**	meters
Stone	**395**	cu. meters

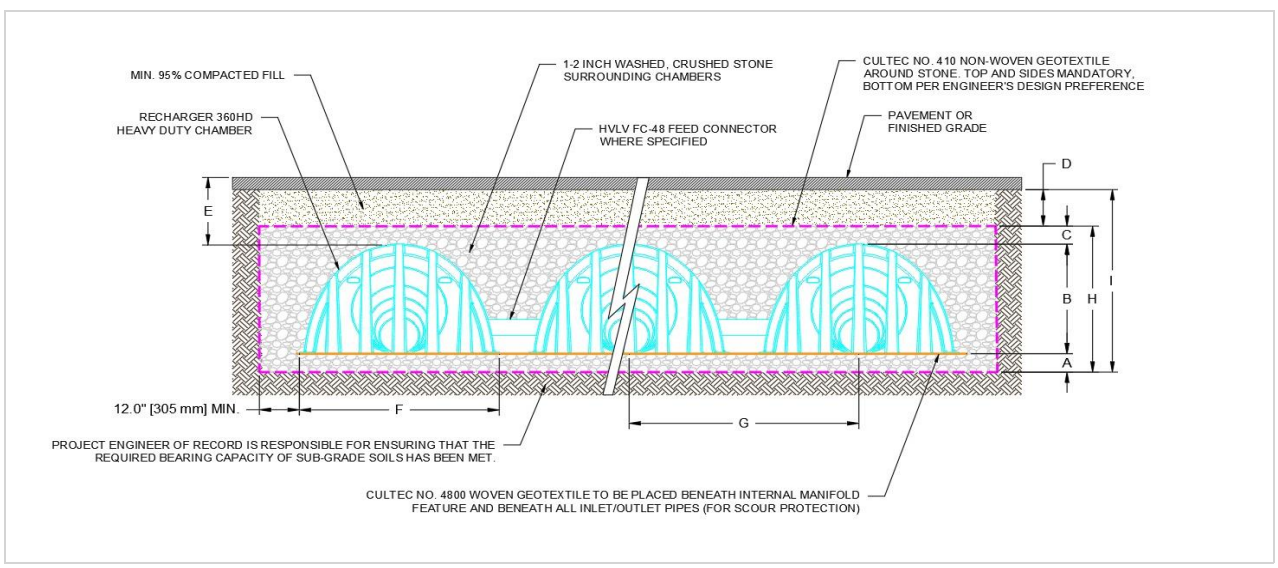
Based on 2 Internal Manifolds

Bed Detail



Bed detail for reference only. Not project specific. Not to scale.

Bed Layout Information		
Number of Rows Wide	**21**	pieces
Number of Chambers Long	**8**	pieces
Chamber Row Width	**38.10**	meters
Chamber Row Length	**9.71**	meters
Bed Width	**38.71**	meters
Bed Length	**10.32**	meters
Bed Area Required	**399.50**	sq. meters
Length of Separator Row	**N/A**	meters



Conceptual graphic only. Not job specific.

CLICK FOR STAGE-STORAGE REPORT

Cross Section Table Reference			
A	Depth of Stone Base	**229**	mm
B	Chamber Height	**914**	mm
C	Depth of Stone Above Units	**305**	mm
D	Depth of 95% Compacted Fill	**305**	mm
E	Max. Depth Allowed Above the Chamber	**3.66**	meters
F	Chamber Width	**1524**	mm
G	Center to Center Spacing	**1.83**	meters
H	Effective Depth	**1.45**	meters
I	Bed Depth	**1.75**	meters

CULTEC Stage-Storage Calculations

Date:	April 19, 2023

Project Information:

Project Number:
0

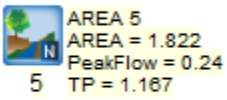
SEE REPORT

Chamber Model -	**Recharger 360HD**	
Number of Rows-	21	units
Total Number of Chambers -	168	units
HVLV FC-24 Feed Connectors-	40	units
Stone Void -	40	%
Stone Base -	229	mm
Stone Above Units -	305	mm
Area -	399.50	m2
Base of Stone Elevation -	140.84	

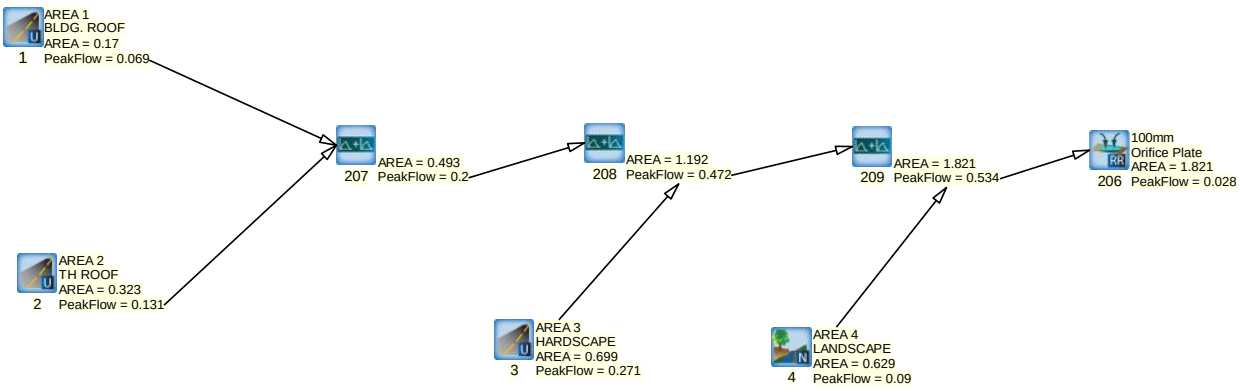
Recharger 360HD Incremental Storage Volumes

Height of System		Chamber Volume		HVLV Feed Connector Volume		Stone Volume		Cumulative Storage Volume		Total Cumulative Storage Volume		Elevation		
in	mm	ft^3	m^3	ft3	m3	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft	m	
57.0	1448	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	12031.66	340.70	4.750	142.29	Top of Stone Elevation
56.0	1422	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	11888.31	336.64	4.670	142.26	
55.0	1397	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	11744.97	332.58	4.580	142.24	
54.0	1372	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	11601.63	328.52	4.500	142.21	
53.0	1346	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	11458.29	324.46	4.420	142.19	
52.0	1321	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	11314.95	320.40	4.330	142.16	
51.0	1295	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	11171.61	316.34	4.250	142.14	
50.0	1270	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	11028.27	312.29	4.170	142.11	
49.0	1245	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	10884.93	308.23	4.080	142.08	
48.0	1219	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	10741.59	304.17	4.000	142.06	
47.0	1194	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	10598.25	300.11	3.920	142.03	
46.0	1168	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	10454.91	296.05	3.830	142.01	
45.0	1143	13.9	0.4	0.0	0.0	137.8	3.9	151.684	4.3	10311.57	291.99	3.750	141.98	Top of Chamber Elevation
44.0	1118	29.4	0.8	0.0	0.0	131.6	3.7	161.006	4.6	10159.88	287.70	3.670	141.96	
43.0	1092	43.8	1.2	0.0	0.0	125.8	3.6	169.612	4.8	9998.88	283.14	3.580	141.93	
42.0	1067	73.7	2.1	0.0	0.0	113.9	3.2	187.571	5.3	9829.26	278.33	3.500	141.91	
41.0	1041	93.1	2.6	0.0	0.0	106.1	3.0	199.183	5.6	9641.69	273.02	3.420	141.88	
40.0	1016	107.7	3.0	0.0	0.0	100.3	2.8	207.950	5.9	9442.51	267.38	3.330	141.86	
39.0	991	119.9	3.4	0.0	0.0	95.4	2.7	215.275	6.1	9234.56	261.49	3.250	141.83	
38.0	965	130.5	3.7	0.0	0.0	91.1	2.6	221.641	6.3	9019.29	255.40	3.170	141.81	
37.0	940	139.9	4.0	0.0	0.0	87.4	2.5	227.301	6.4	8797.64	249.12	3.080	141.78	
36.0	914	148.4	4.2	0.0	0.0	84.0	2.4	232.406	6.6	8570.34	242.68	3.000	141.75	
35.0	889	156.2	4.4	0.0	0.0	80.9	2.3	237.066	6.7	8337.94	236.10	2.920	141.73	
34.0	864	163.3	4.6	0.0	0.0	78.0	2.2	241.334	6.8	8100.87	229.39	2.830	141.70	
33.0	838	170.3	4.8	0.0	0.0	75.2	2.1	245.531	7.0	7859.54	222.56	2.750	141.68	
32.0	813	176.4	5.0	0.0	0.0	72.8	2.1	249.193	7.1	7614.01	215.60	2.670	141.65	
31.0	787	182.1	5.2	0.0	0.0	70.5	2.0	252.593	7.2	7364.82	208.55	2.580	141.63	
30.0	762	187.4	5.3	0.0	0.0	68.4	1.9	255.781	7.2	7112.22	201.40	2.500	141.60	
29.0	737	192.4	5.4	0.0	0.0	66.4	1.9	258.777	7.3	6856.44	194.15	2.420	141.58	
28.0	711	197.1	5.6	0.0	0.0	64.5	1.8	261.601	7.4	6597.67	186.82	2.330	141.55	
27.0	686	201.5	5.7	0.0	0.0	62.7	1.8	264.265	7.5	6336.06	179.42	2.250	141.53	
26.0	660	205.3	5.8	0.0	0.0	61.2	1.7	266.545	7.5	6071.80	171.93	2.170	141.50	
25.0	635	209.3	5.9	0.0	0.0	59.6	1.7	268.936	7.6	5805.25	164.39	2.080	141.48	
24.0	610	213.1	6.0	0.0	0.0	58.1	1.6	271.216	7.7	5536.32	156.77	2.000	141.45	
23.0	584	216.7	6.1	0.0	0.0	56.7	1.6	273.375	7.7	5265.10	149.09	1.920	141.42	
22.0	559	220.1	6.2	0.0	0.0	55.3	1.6	275.422	7.8	4991.73	141.35	1.830	141.40	
21.0	533	223.0	6.3	0.0	0.0	54.2	1.5	277.117	7.8	4716.31	133.55	1.750	141.37	
20.0	508	226.1	6.4	0.0	0.0	52.9	1.5	278.974	7.9	4439.19	125.70	1.670	141.35	
19.0	483	229.0	6.5	0.0	0.0	51.7	1.5	280.739	7.9	4160.21	117.80	1.580	141.32	
18.0	457	231.4	6.6	0.0	0.0	50.8	1.4	282.172	8.0	3879.48	109.85	1.500	141.30	
17.0	432	234.0	6.6	0.0	0.0	49.7	1.4	283.766	8.0	3597.30	101.86	1.420	141.27	
16.0	406	236.6	6.7	0.0	0.0	48.7	1.4	285.289	8.1	3313.54	93.83	1.330	141.25	
15.0	381	239.0	6.8	0.0	0.0	47.7	1.4	286.731	8.1	3028.25	85.75	1.250	141.22	
14.0	356	240.9	6.8	0.0	0.0	47.0	1.3	287.861	8.2	2741.52	77.63	1.170	141.20	
13.0	330	243.0	6.9	0.0	0.0	46.1	1.3	289.163	8.2	2453.66	69.48	1.080	141.17	
12.0	305	244.7	6.9	0.0	0.0	45.5	1.3	290.151	8.2	2164.49	61.29	1.000	141.14	
11.0	279	246.7	7.0	0.0	0.0	44.7	1.3	291.342	8.2	1874.34	53.08	0.920	141.12	
10.0	254	249.3	7.1	0.0	0.0	43.6	1.2	292.935	8.3	1583.00	44.83	0.830	141.09	
9.0	229	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	1290.07	36.53	0.750	141.07	Bottom of Chamber Elevation
8.0	203	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	1146.73	32.47	0.670	141.04	
7.0	178	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	1003.38	28.41	0.580	141.02	
6.0	152	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	860.04	24.35	0.500	140.99	
5.0	127	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	716.70	20.29	0.420	140.97	
4.0	102	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	573.36	16.24	0.330	140.94	
3.0	76	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	430.02	12.18	0.250	140.92	
2.0	51	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	286.68	8.12	0.170	140.89	
1.0	25	0.0	0.0	0.0	0.0	143.3	4.1	143.341	4.1	143.34	4.06	0.080	140.87	
0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.00	0.00	0.000	140.84	Bottom of Stone Elevation
-1.0														

VISUAL OTTHYMO MODEL-Pre-Development



VISUAL OTTHYMO MODEL-Post-Development



VISUAL OTTHYMO OUTPUT-Pre-Development

```
       V    V   I    SSSSS  U   U    A    L
       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
       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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                  *****  D E T A I L E D   O U T P U T *****
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```
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=2464.000
| Ptotal= 37.70 mm |                          B=  16.000
--------------------                          C=   1.000
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    1.53 |  1.00   94.77 |  1.83    4.54 |  2.67    1.39
                 .33    2.32 |  1.17   36.99 |  2.00    3.37 |  2.83    1.17
                 .50    3.95 |  1.33   17.18 |  2.17    2.60 |  3.00    1.00
                 .67    8.18 |  1.50    9.92 |  2.33    2.06 |
                 .83   27.06 |  1.67    6.46 |  2.50    1.68 |


--------------------
| CALIB            |
| NASHYD    (0005) |   Area    (ha)=   1.82   Curve Number   (CN)= 80.0
|ID= 1 DT=10.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20

     Unit Hyd Qpeak  (cms)=    .348

     PEAK FLOW       (cms)=    .075 (i)
     TIME TO PEAK    (hrs)=   1.167
     RUNOFF VOLUME    (mm)=  10.824
     TOTAL RAINFALL   (mm)=  37.696
     RUNOFF COEFFICIENT   =    .287

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=5588.000
| Ptotal= 80.54 mm |                          B=  28.000
--------------------                          C=   1.000
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    5.26 |  1.00  147.05 |  1.83   14.14 |  2.67    4.81
                 .33    7.73 |  1.17   77.70 |  2.00   10.82 |  2.83    4.10
                 .50   12.46 |  1.33   43.43 |  2.17    8.55 |  3.00    3.54
                 .67   23.45 |  1.50   27.74 |  2.33    6.93 |
                 .83   60.52 |  1.67   19.25 |  2.50    5.73 |


------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0005) |   Area    (ha)=   1.82   Curve Number   (CN)= 80.0
|ID= 1 DT=10.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20

     Unit Hyd Qpeak  (cms)=    .348

     PEAK FLOW       (cms)=    .240 (i)
     TIME TO PEAK    (hrs)=   1.167
     RUNOFF VOLUME    (mm)=  39.971
     TOTAL RAINFALL   (mm)=  80.536
     RUNOFF COEFFICIENT   =    .496

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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 FINISH
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VISUAL OTTHYMO OUTPUT-Post-Development

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       V    V   I    SSSSS  U   U    A    L
       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
       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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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\VO Dongle Driver\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: P:\2021\21241\1926 (21241-04223) - Port Hope (PH)\Design and Reports\Computer
Analysis\OTTHYMO-NAUTICAL SITE-Chicago-4hr
  Summary filename: P:\2021\21241\1926 (21241-04223) - Port Hope (PH)\Design and Reports\Computer
Analysis\OTTHYMO-NAUTICAL SITE-Chicago-4hr


DATE: 4/19/2023                           TIME: 2:14:45 PM

USER:


COMMENTS: _____________________________________________________________

----------------------------------------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=2464.000
| Ptotal= 38.49 mm |                          B=  16.000
--------------------                          C=   1.000
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17     .81 |  1.17   27.06 |  2.17    4.54 |  3.17    1.17
                 .33    1.09 |  1.33   94.77 |  2.33    3.37 |  3.33    1.00
                 .50    1.53 |  1.50   36.99 |  2.50    2.60 |  3.50     .87
                 .67    2.32 |  1.67   17.18 |  2.67    2.06 |  3.67     .76
                 .83    3.95 |  1.83    9.92 |  2.83    1.68 |  3.83     .67
                1.00    8.18 |  2.00    6.46 |  3.00    1.39 |  4.00     .59


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0004) |   Area    (ha)=    .63   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .17

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
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```
                    ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
  .083     .81 | 1.083   27.06 | 2.083    4.54 |  3.08    1.17
  .167     .81 | 1.167   27.06 | 2.167    4.54 |  3.17    1.17
  .250    1.09 | 1.250   94.77 | 2.250    3.37 |  3.25    1.00
  .333    1.09 | 1.333   94.77 | 2.333    3.37 |  3.33    1.00
  .417    1.53 | 1.417   36.99 | 2.417    2.60 |  3.42     .87
  .500    1.53 | 1.500   36.99 | 2.500    2.60 |  3.50     .87
  .583    2.32 | 1.583   17.18 | 2.583    2.06 |  3.58     .76
  .667    2.32 | 1.667   17.18 | 2.667    2.06 |  3.67     .76
  .750    3.95 | 1.750    9.92 | 2.750    1.68 |  3.75     .67
  .833    3.95 | 1.833    9.92 | 2.833    1.68 |  3.83     .67
  .917    8.18 | 1.917    6.46 | 2.917    1.39 |  3.92     .59
 1.000    8.18 | 2.000    6.46 | 3.000    1.39 |  4.00     .59

     Unit Hyd Qpeak  (cms)=    .141

     PEAK FLOW       (cms)=    .029 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=  11.523
     TOTAL RAINFALL   (mm)=  38.492
     RUNOFF COEFFICIENT   =    .299

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=    .70
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .63          .07
     Dep. Storage     (mm)=      1.00         1.00
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     68.30        40.00
     Mannings n           =      .013         .250

     Max.Eff.Inten.(mm/hr)=     94.77        31.12
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      2.08 (ii)    5.07 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=       .31          .16
                                                      *TOTALS*
     PEAK FLOW       (cms)=       .16          .01          .169 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=     37.49        13.92        35.13
     TOTAL RAINFALL   (mm)=     38.49        38.49        38.49
     RUNOFF COEFFICIENT   =       .97          .36          .91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .17
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .17          .00
     Dep. Storage     (mm)=      1.00         1.00
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     33.70        40.00
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```
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      94.77       155.61
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.36 (ii)    2.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .29
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .04          .00          .044 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      37.49        13.92         37.25
     TOTAL RAINFALL   (mm)=      38.49        38.49         38.49
     RUNOFF COEFFICIENT   =        .97          .36           .97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=    .32
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .32          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      46.40        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      94.77        77.81
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.65 (ii)    2.79 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .32          .28
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .08          .00          .084 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      37.49        13.92         37.25
     TOTAL RAINFALL   (mm)=      38.49        38.49         38.49
     RUNOFF COEFFICIENT   =        .97          .36           .97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0207) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .17    .044     1.33    37.25
        + ID2= 2 (0002):      .32    .084     1.33    37.25
          ================================================
          ID = 3 (0207):      .49    .129     1.33    37.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| ADD HYD   (0208) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):       .70    .169     1.33    35.13
        + ID2= 2 (0207):       .49    .129     1.33    37.25
          ================================================
          ID = 3 (0208):     1.19    .298     1.33    36.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0209) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):       .63    .029     1.50    11.52
        + ID2= 2 (0208):     1.19    .298     1.33    36.01
          ================================================
          ID = 3 (0209):     1.82    .315     1.33    27.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0206) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0236       .0691
                           .0162      .0102   |    .0255       .0822
                           .0170      .0118   |    .0272       .0950
                           .0194      .0255   |    .0288       .1039
                           .0216      .0394   |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0209)      1.821       .315        1.33       27.55
     OUTFLOW: ID= 1 (0206)      1.821       .021        2.17       27.47

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.77
                   TIME SHIFT OF PEAK FLOW         (min)= 50.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0379

--------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   6 **
  ***************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=5588.000
| Ptotal= 83.38 mm |                          B=  28.000
--------------------                          C=   1.000
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    2.89 |  1.17   60.52 |  2.17   14.14 |  3.17    4.10
                 .33    3.81 |  1.33  147.05 |  2.33   10.82 |  3.33    3.54
                 .50    5.26 |  1.50   77.70 |  2.50    8.55 |  3.50    3.08
                 .67    7.73 |  1.67   43.43 |  2.67    6.93 |  3.67    2.71
                 .83   12.46 |  1.83   27.74 |  2.83    5.73 |  3.83    2.40
                1.00   23.45 |  2.00   19.25 |  3.00    4.81 |  4.00    2.14


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| CALIB            |
| NASHYD    (0004) |   Area     (ha)=    .63   Curve Number    (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .17

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    2.89 | 1.083   60.52 | 2.083   14.14 |  3.08    4.10
                .167    2.89 | 1.167   60.52 | 2.167   14.14 |  3.17    4.10
                .250    3.81 | 1.250  147.05 | 2.250   10.82 |  3.25    3.54
                .333    3.81 | 1.333  147.05 | 2.333   10.82 |  3.33    3.54
                .417    5.26 | 1.417   77.70 | 2.417    8.55 |  3.42    3.08
                .500    5.26 | 1.500   77.70 | 2.500    8.55 |  3.50    3.08
                .583    7.73 | 1.583   43.43 | 2.583    6.93 |  3.58    2.71
                .667    7.73 | 1.667   43.43 | 2.667    6.93 |  3.67    2.71
                .750   12.46 | 1.750   27.74 | 2.750    5.73 |  3.75    2.40
                .833   12.46 | 1.833   27.74 | 2.833    5.73 |  3.83    2.40
                .917   23.45 | 1.917   19.25 | 2.917    4.81 |  3.92    2.14
               1.000   23.45 | 2.000   19.25 | 3.000    4.81 |  4.00    2.14

     Unit Hyd Qpeak  (cms)=    .141

     PEAK FLOW       (cms)=    .092 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=  43.141
     TOTAL RAINFALL   (mm)=  83.375
     RUNOFF COEFFICIENT   =    .517

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area     (ha)=    .70
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .63          .07
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      68.30        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     147.05        78.94
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.74 (ii)    4.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .32          .23
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .26          .02          .272 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      82.38        46.52         78.79
     TOTAL RAINFALL   (mm)=      83.38        83.38         83.38
     RUNOFF COEFFICIENT   =        .99          .56           .94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area     (ha)=    .17
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      33.70        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     147.05       394.73
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.14 (ii)    2.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .31
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .07          .00          .069 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      82.38        46.52         82.01
     TOTAL RAINFALL   (mm)=      83.38        83.38         83.38
     RUNOFF COEFFICIENT   =        .99          .56           .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=    .32
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .32          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      46.40        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     147.05       197.36
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.38 (ii)    2.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .30
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .13          .00          .131 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      82.38        46.52         82.01
     TOTAL RAINFALL   (mm)=      83.38        83.38         83.38
     RUNOFF COEFFICIENT   =        .99          .56           .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0207) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .17     .069     1.33    82.01
        + ID2= 2 (0002):       .32     .131     1.33    82.01
          ================================================
```

```
          ID = 3 (0207):      .49    .200     1.33    82.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0208) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):      .70    .272     1.33    78.79
        + ID2= 2 (0207):      .49    .200     1.33    82.01
          ================================================
          ID = 3 (0208):     1.19    .472     1.33    80.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0209) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):      .63    .092     1.50    43.14
        + ID2= 2 (0208):     1.19    .472     1.33    80.12
          ================================================
          ID = 3 (0209):     1.82    .537     1.33    67.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0206) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0236       .0691
                          .0162      .0102    |    .0255       .0822
                          .0170      .0118    |    .0272       .0950
                          .0194      .0255    |    .0288       .1039
                          .0216      .0394    |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0209)     1.821       .537        1.33       67.35
     OUTFLOW: ID= 1 (0206)     1.821       .028        2.83       67.27

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.17
                  TIME SHIFT OF PEAK FLOW         (min)= 90.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=   .0981

--------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   7 **
  ***************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=5588.000
| Ptotal= 80.54 mm |                          B=  28.000
--------------------                          C=   1.000
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .17    5.26 |  1.00  147.05 |  1.83   14.14 |  2.67    4.81
                .33    7.73 |  1.17   77.70 |  2.00   10.82 |  2.83    4.10
                .50   12.46 |  1.33   43.43 |  2.17    8.55 |  3.00    3.54
```

```
                .67   23.45 |  1.50   27.74 |  2.33    6.93 |
                .83   60.52 |  1.67   19.25 |  2.50    5.73 |


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0004) |   Area    (ha)=    .63   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .17

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                           ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .083    5.26 |  .833   60.52 | 1.583   19.25 |  2.33    6.93
               .167    5.26 |  .917  147.05 | 1.667   19.25 |  2.42    5.73
               .250    7.73 | 1.000  147.05 | 1.750   14.14 |  2.50    5.73
               .333    7.73 | 1.083   77.70 | 1.833   14.14 |  2.58    4.81
               .417   12.46 | 1.167   77.70 | 1.917   10.82 |  2.67    4.81
               .500   12.46 | 1.250   43.43 | 2.000   10.82 |  2.75    4.10
               .583   23.45 | 1.333   43.43 | 2.083    8.55 |  2.83    4.10
               .667   23.45 | 1.417   27.74 | 2.167    8.55 |  2.92    3.54
               .750   60.52 | 1.500   27.74 | 2.250    6.93 |  3.00    3.54

     Unit Hyd Qpeak  (cms)=    .141

     PEAK FLOW       (cms)=    .090 (i)
     TIME TO PEAK    (hrs)=   1.167
     RUNOFF VOLUME    (mm)=  40.891
     TOTAL RAINFALL   (mm)=  80.536
     RUNOFF COEFFICIENT   =    .508

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=    .70
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .63          .07
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      68.30        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     147.05        77.27
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.74 (ii)    4.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .32          .23
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .26          .01          .271 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      79.54        44.23         76.00
     TOTAL RAINFALL   (mm)=      80.54        80.54         80.54
     RUNOFF COEFFICIENT   =        .99          .55           .94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .17
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      33.70        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     147.05       386.35
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.14 (ii)    2.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .31
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .07          .00          .069 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      79.54        44.23         79.18
     TOTAL RAINFALL   (mm)=      80.54        80.54         80.54
     RUNOFF COEFFICIENT   =        .99          .55           .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=    .32
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .32          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      46.40        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     147.05       193.18
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.38 (ii)    2.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .30
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .13          .00          .131 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      79.54        44.23         79.17
     TOTAL RAINFALL   (mm)=      80.54        80.54         80.54
     RUNOFF COEFFICIENT   =        .99          .55           .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0207) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
          ID1= 1 (0001):      .17    .069     1.00    79.18
        + ID2= 2 (0002):      .32    .131     1.00    79.17
          ================================================
          ID = 3 (0207):      .49    .200     1.00    79.18

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0208) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):      .70    .271     1.00    76.00
        + ID2= 2 (0207):      .49    .200     1.00    79.18
          ================================================
          ID = 3 (0208):     1.19    .472     1.00    77.31

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0209) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):      .63    .090     1.17    40.89
        + ID2= 2 (0208):     1.19    .472     1.00    77.31
          ================================================
          ID = 3 (0209):     1.82    .534     1.00    64.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0206) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000       .0000   |    .0236       .0691
                          .0162       .0102   |    .0255       .0822
                          .0170       .0118   |    .0272       .0950
                          .0194       .0255   |    .0288       .1039
                          .0216       .0394   |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0209)     1.821       .534        1.00       64.73
     OUTFLOW: ID= 1 (0206)     1.821       .028        2.50       64.65

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.16
                    TIME SHIFT OF PEAK FLOW         (min)= 90.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=   .0967

--------------------------------------------------------------------------------

 FINISH
================================================================================================================
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Hydroworks

Hydroworks Sizing Summary

Proposed Senior Living Residential Development
60 Henderson St, Port Hope

02-04-2022

Recommended Size: HydroDome HD 6

A HydroDome HD 6 is recommended to provide 80 % annual TSS removal based on a drainage area of 1.821 (ha) with an imperviousness of 65 % and Peterborough, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended HydroDome HD 6 treats 86 % of the annual runoff and provides 81 % annual TSS removal for the Peterborough rainfall records and 20 um to 2000 um particle size distribution.

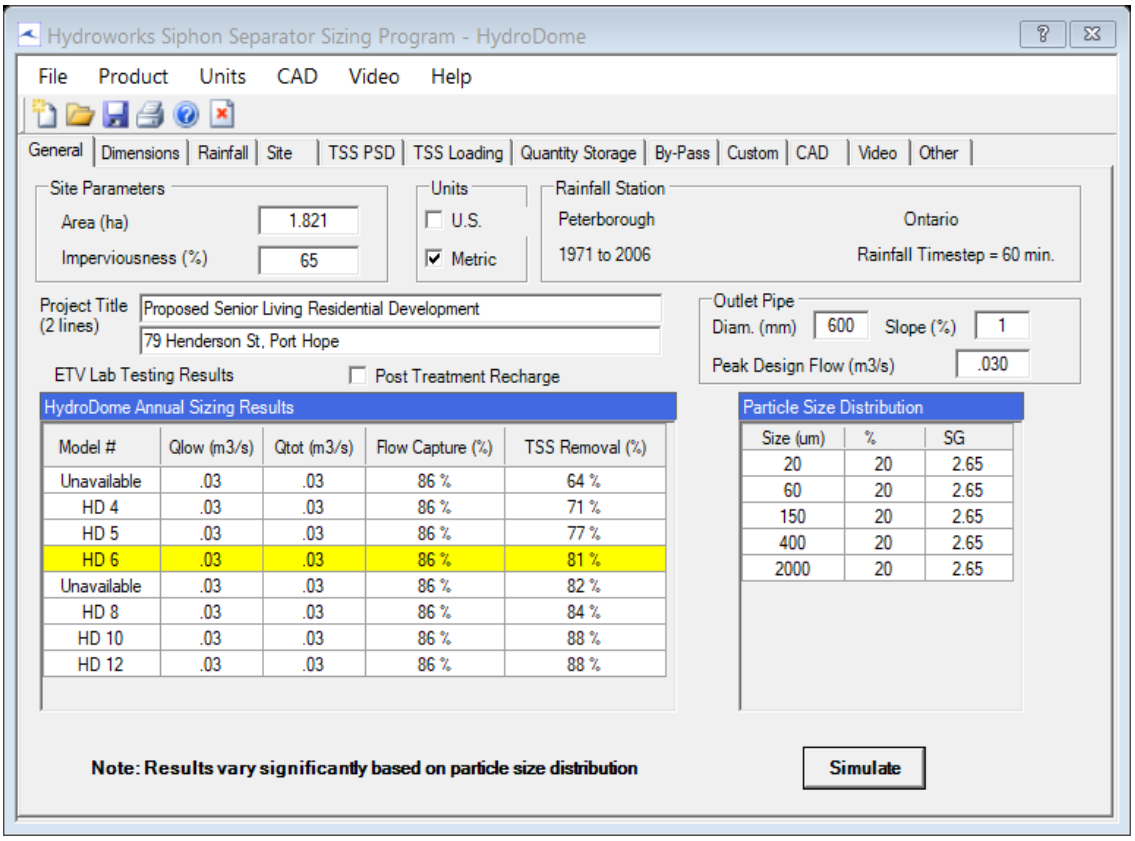
The HydroDome has a siphon which creates a discontinuity in headloss. The given peak flow of .03 (m3/s) Is less than the full pipe flow of 21.68 (m3/s) indicating free flow in the pipe during the peak flow assuming no tailwater condition. Partial pipe flow was assumed for the headloss calculations. The headloss was calculated to be 208 (mm) above the crown of the 600 (mm) outlet pipe.

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

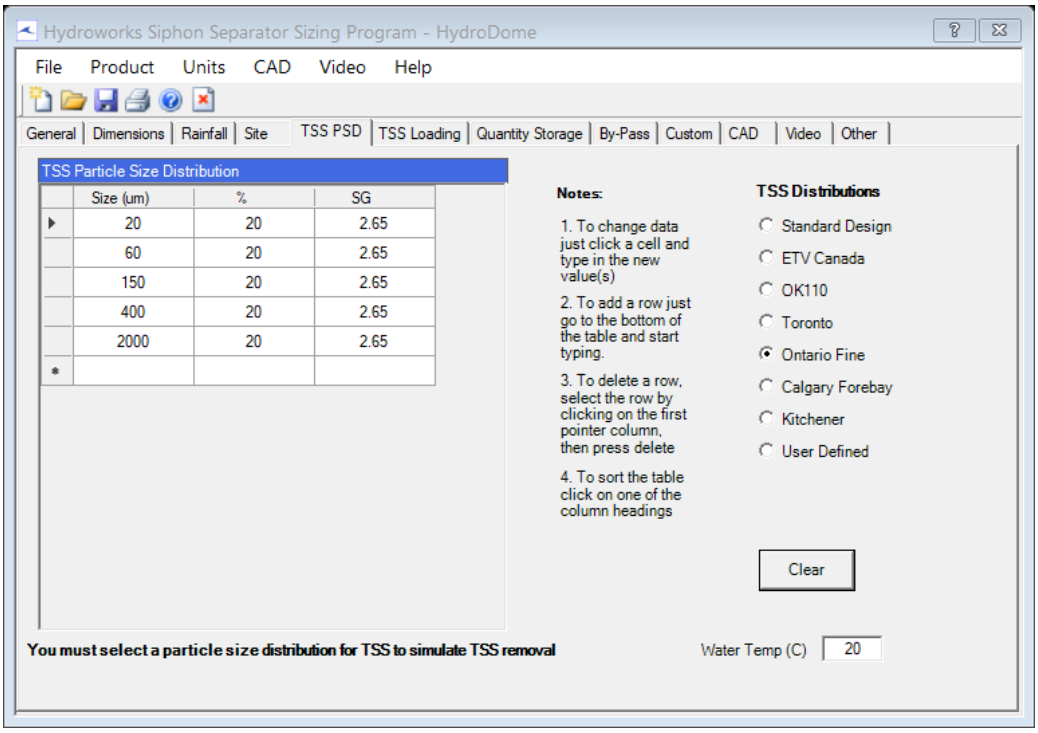
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

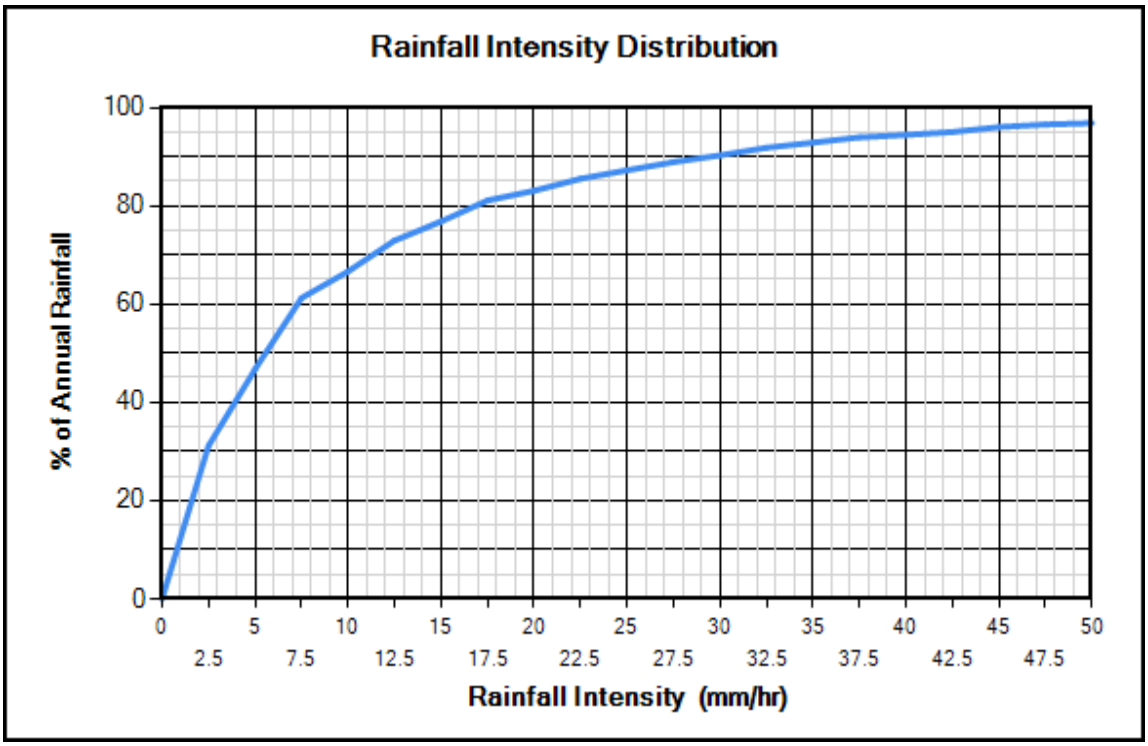
The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroDome .

TSS Removal Sizing Summary

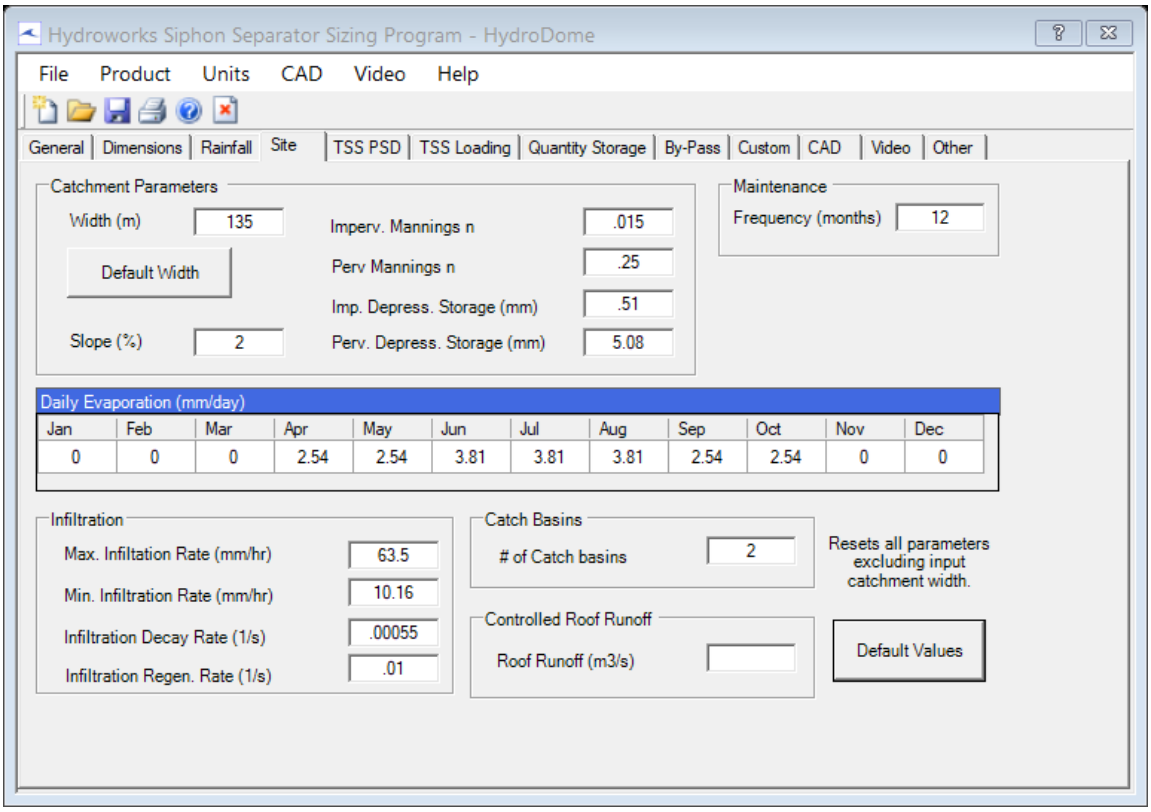


TSS Particle Size Distribution

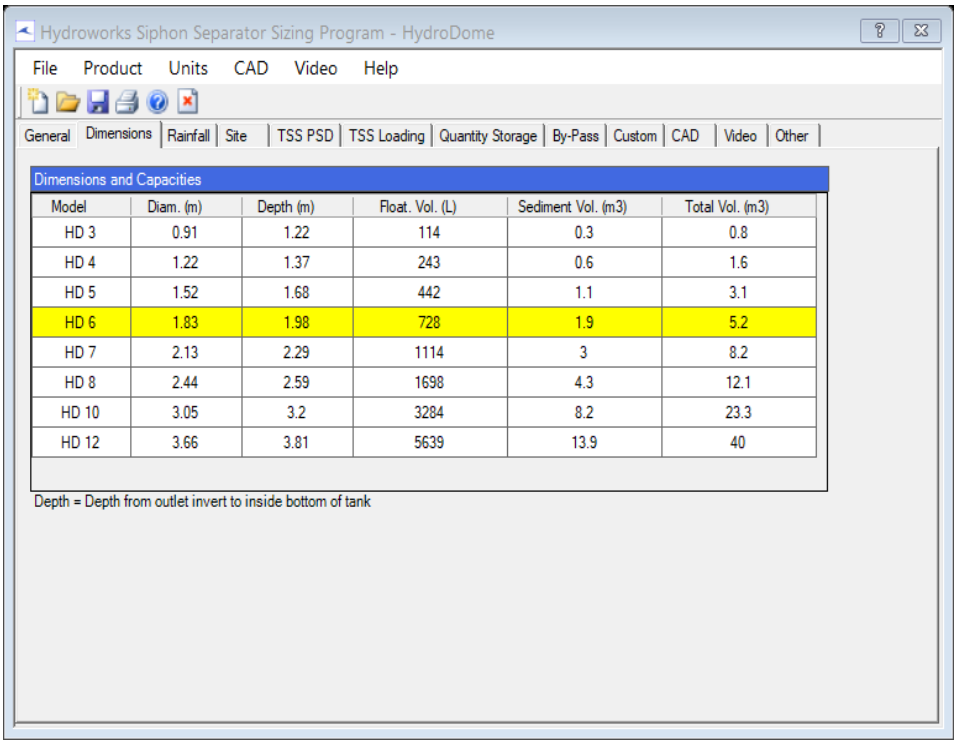




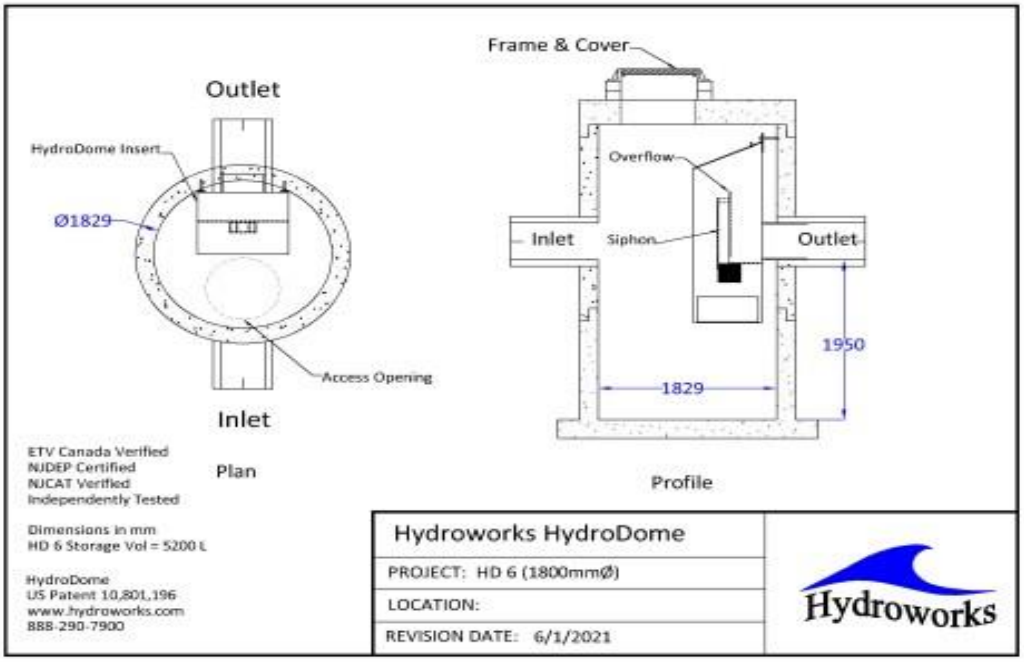
Site Physical Characteristics



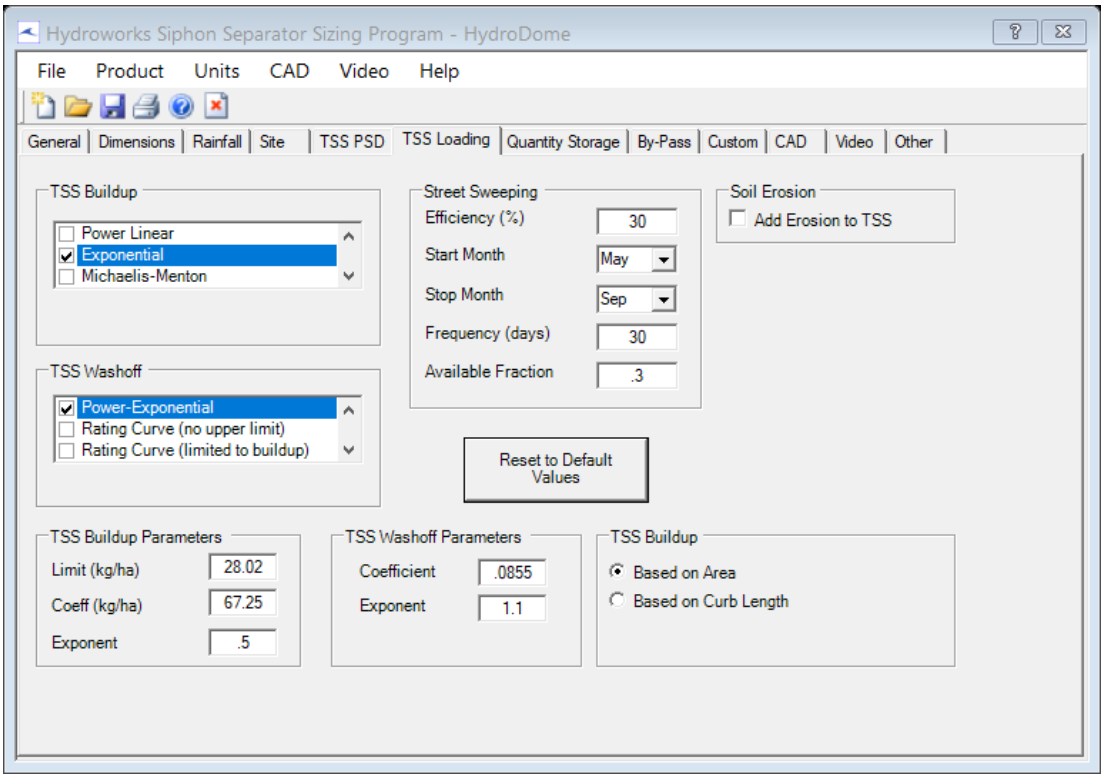
Dimensions And Capacities



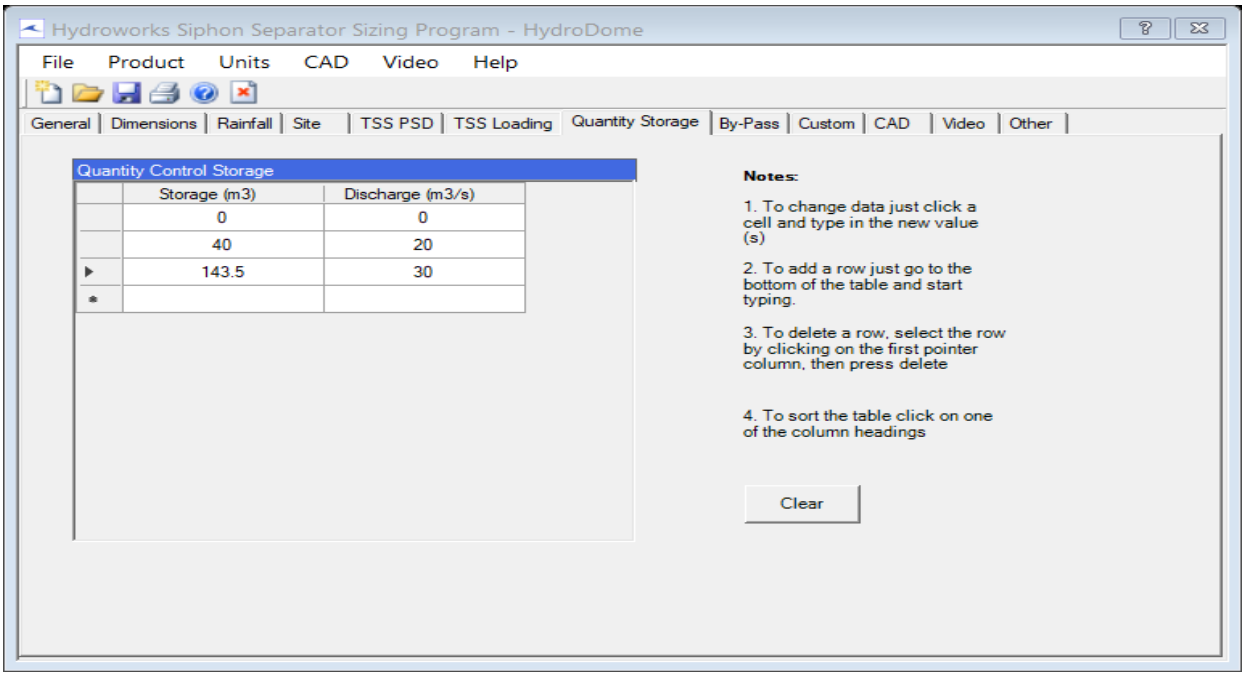
Generic HD 6 CAD Drawing



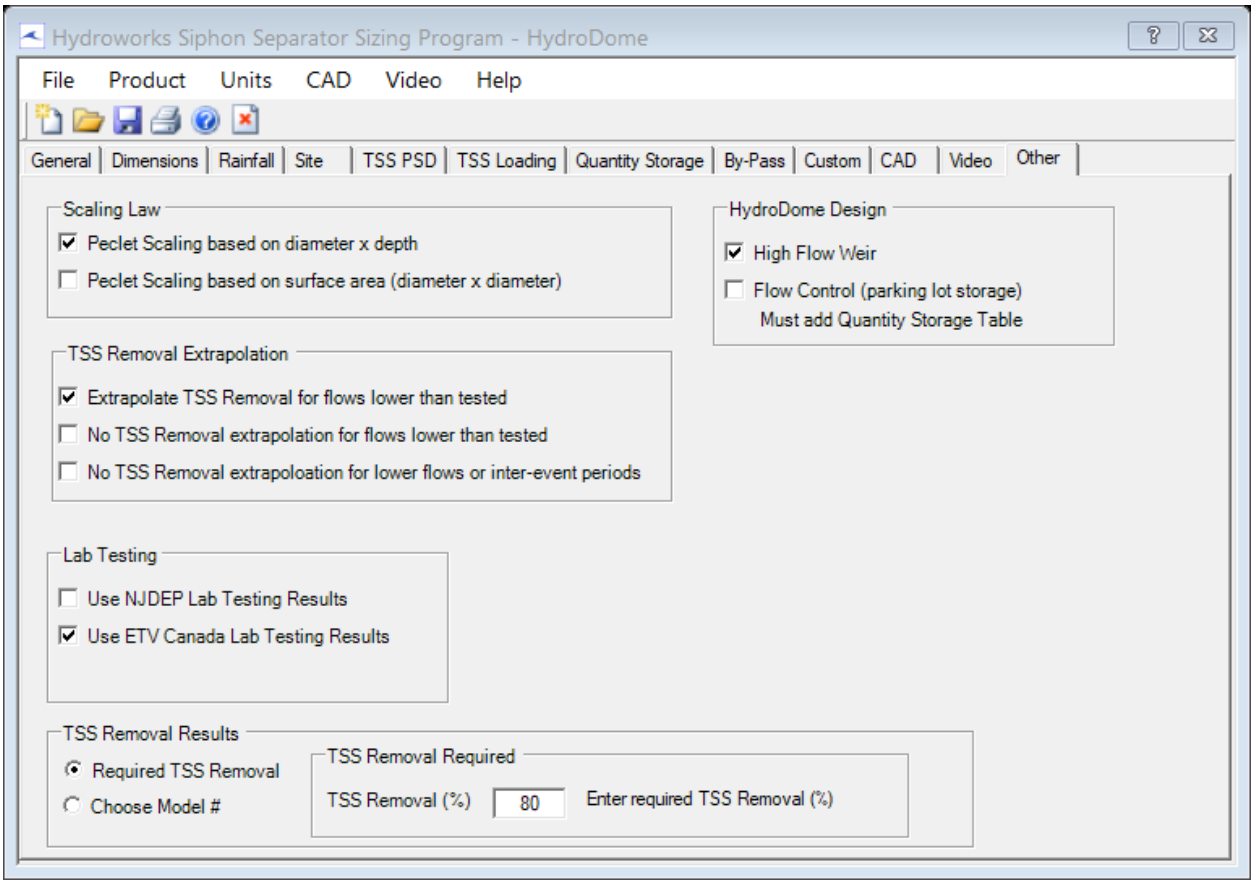
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Hydroworks Sizing Program - Version 5.5
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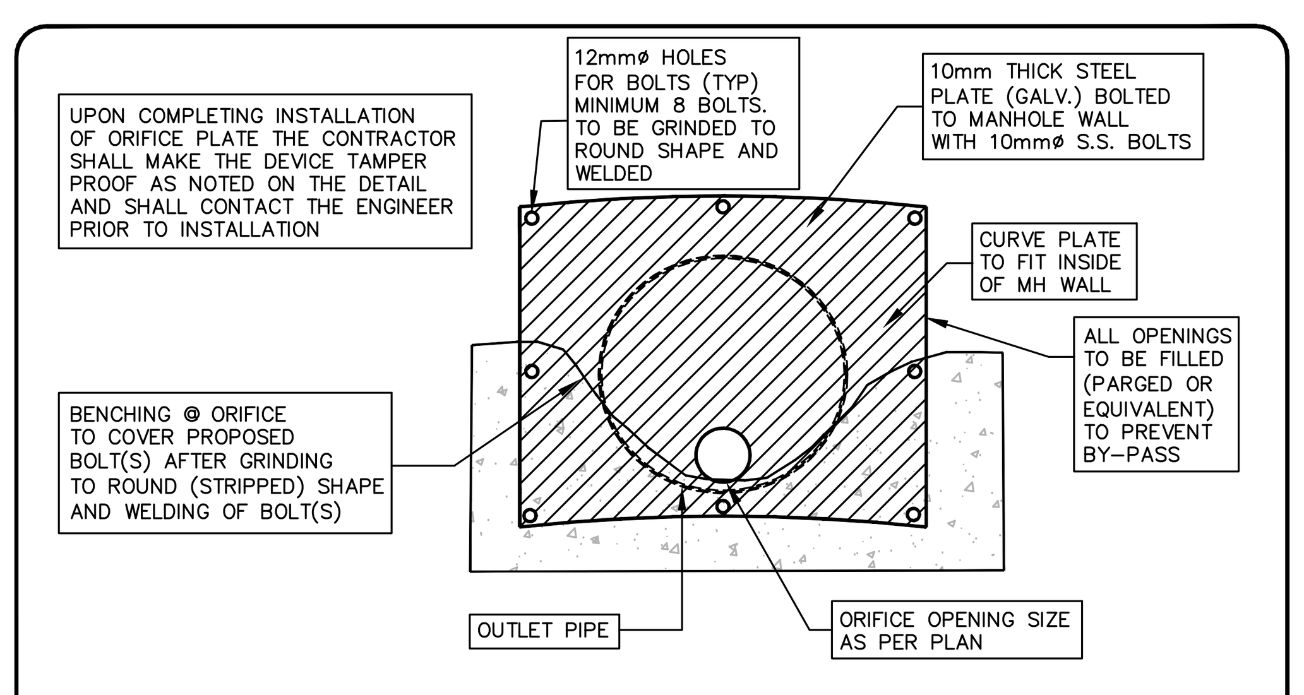
APPENDIX E

ODAN/DETECH GROUP ENGINEERING DRAWINGS

CONCEPT SITE SERVICING

CONCEPT SITE GRADING

CROSS SECTION POND



ORIFICE PLATE DETAIL
NTS

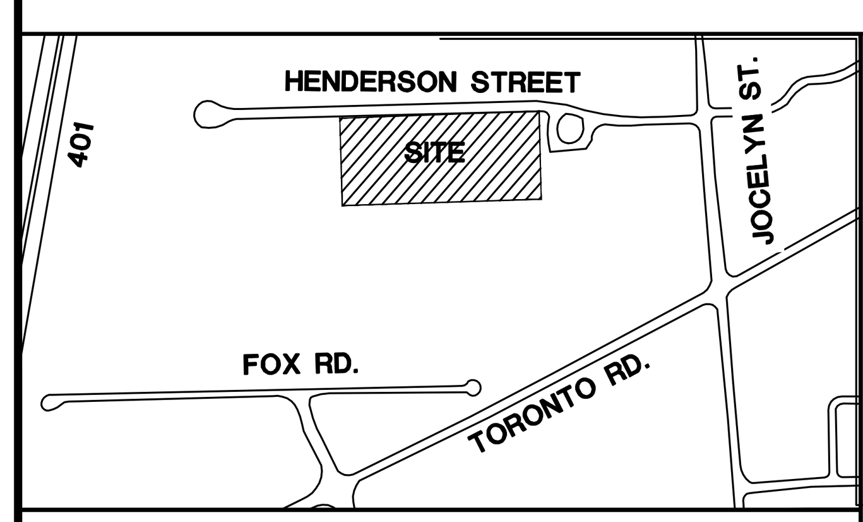
CONTRACTOR TO VERIFY ALL INVERTS, SIZE, MATERIAL, AND LOCATION OF ALL SERVICES PRIOR TO CONSTRUCTION AND REPORT ANY DISCREPANCIES TO THE ODAN/DETECH GROUP

CONTRACTOR TO PROVIDE AS-BUILT DRAWINGS COMPLED BY AN ONTARIO LAND SURVEYOR UPON COMPLETION OF ALL WORKS TO THE ODAN/DETECH GROUP

CONTRACTOR SHALL REFER TO ARCHITECTURAL SITE PLAN AND LANDSCAPE PLANS FOR ADDITIONAL DETAILS RELATED TO SITE WORKS

SERVICING LEGEND:

- DENOTES EXISTING STORM MANHOLE
- DENOTES PROPOSED STORM MANHOLE
- DENOTES EXISTING CATCH BASIN
- DENOTES PROPOSED CATCHBASIN
- DENOTES PROPOSED STORMCEPTOR
- DENOTES PROPOSED INLET CONTROL DEVICE (ICD)
- DENOTES EXISTING STORM SEWER
- DENOTES PROPOSED STORM SEWER
- DENOTES PROPOSED SUB-DRAIN
- DENOTES EXISTING SANITARY MANHOLE
- DENOTES PROPOSED SANITARY MANHOLE
- DENOTES PROPOSED SANITARY SEWER
- DENOTES EXISTING SANITARY SEWER
- DENOTES PROPOSED HYDRANT
- DENOTES EXISTING HYDRANT
- DENOTES PROPOSED WATER VALVE & BOX
- DENOTES EXISTING WATER VALVE & BOX
- DENOTES PROPOSED WATER METER
- DENOTES PROPOSED WATER METER
- DENOTES EXISTING WATER MAIN
- DENOTES PROPOSED WATER MAIN
- DENOTES PROPOSED SIAMESE CONNECTION
- DENOTES PROPOSED CAP FOR SANITARY, STORM AND/OR WATER AS NOTED
- DENOTES PROPOSED ENTRANCE LOCATION
- DENOTES INSULATION PIPES
- DENOTES PROPOSED LIMIT OF CONSTRUCTION
- DENOTES PROPOSED HEAVY DUTY ASPHALT AREA



KEY PLAN
Scale : N.T.S.

SUBJECT LANDS

NOTES:

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND UNDERGROUND AND ABOVE GROUND UTILITIES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.BEFORE STARTING THE WORK THE CONTRACTOR SHALL CONFIRM OF THE EXACT LOCATION OF ALL UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS ON THE JOB AND REPORT ANY DISCREPANCY TO THE ARCHITECTS/ENGINEERS BEFORE PROCEEDING WITH THE WORKS.

ALL DRAWINGS AND SPECIFICATIONS ARE INSTRUMENTS OF SERVICE AND THE PROPERTY OF THE ENGINEER WHICH MUST BE RETURNED AT THE COMPLETION OF WORK.

THIS DRAWING IS NOT TO BE SCALED. CONTRACTOR TO USE DIGITAL FILES FOR LAYOUT PROVIDED BY ENGINEER. THIS PLAN MUST NOT BE USED TO SITE THE PROPOSED BUILDINGS.

THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S CONTRACTOR FROM OBTAINING, BUT NOT LIMITED TO THE FOLLOWING PERMITS: ROAD CUT, SEWER PERMITS, RELOCATION OF SERVICES, ENCROACHMENT AGREEMENTS, APPROACH APPROVAL PERMITS, ETC..

EXISTING TOPOGRAPHICAL INFORMATION SUPPLIED BY SYLVESTER & BROWN LAND SURVEYING. DATED JULY 23, 2021.

BENCH MARK:

ELEVATIONS ARE GEODETIC, DERIVED BY RTK GPS OBSERVATIONS USING THE TOPNET REAL-TIME NETWORK SERVICE AND REFERRED TO CGVD28-1978 USING THE NRCAN HTV2.0 GEOID SEPARATION MODEL.

METRIC NOTE:

DISTANCES AND ELEVATIONS ON THIS PLAN ARE TYPICALLY SHOWN IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NO.	REVISIONS	DATE	BY
6	XXXXXXX	XXX-XX-23	Z.Z.
5	REISSUED FOR ZONING 2ND SUBMISSION	NOV-15-22	M.H.H.
4	~~REISSUED FOR ZONING 2ND SUBMISSION~~ (CANCELLED)	NOV-10-22	M.H.H.
3	ISSUED FOR REVIEW AND COORDINATION	FEB-11-22	G.V.
2	ISSUED FOR REVIEW AND COORDINATION	DEC-15-21	G.V.
1	ISSUED FOR REVIEW AND COORDINATION	DEC-01-21	G.V.

CLIENT :
NAUTICAL LANDS GROUP
29-62 CARP ROAD
CARP, ON. K0A 1L0

PROJECT:
PROPOSED RESIDENTIAL DEVELOPMENT
60 HENDERSON ST
PORT HOPE, ONTARIO

ODAN·DETECH CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

SCALE:
1:300 (0 5 10 20 30)

DRAWING :
CONCEPTUAL SITE SERVICING PLAN

21241 (PH) (ZBA)
PROJECT NUMBER

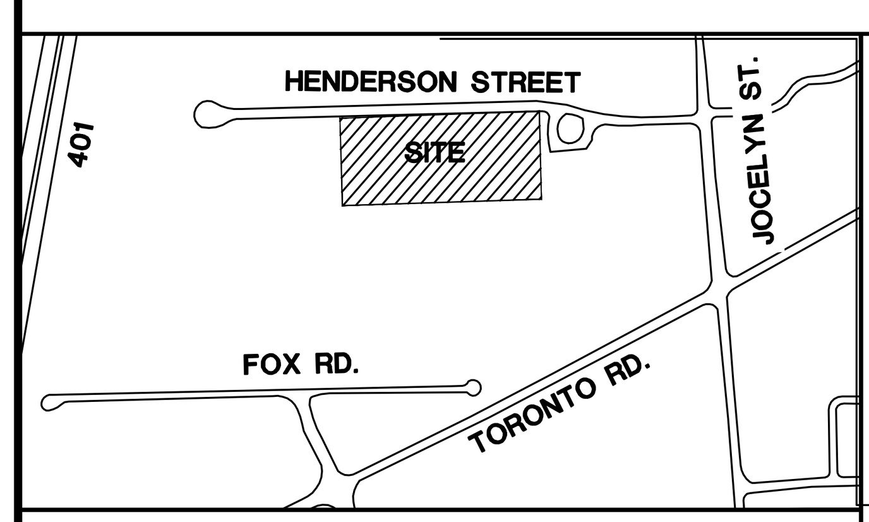
APRIL 2023
DATE:
ENGINEER

DESIGN BY: M.H.H.
DRAWN BY: Z.Z.
CHECKED BY: M.H.H.
APPROVED BY: P.H.
DRWG. NO.: 1 OF 3

GRADING LEGEND:

- DENOTES EXISTING STORM MANHOLE
- DENOTES PROPOSED STORM MANHOLE
- DENOTES EXISTING CATCH BASIN
- DENOTES PROPOSED CATCHBASIN
- DENOTES PROPOSED STORMCEPTOR
- DENOTES EXISTING SANITARY MANHOLE
- DENOTES PROPOSED SANITARY MANHOLE
- DENOTES PROPOSED HYDRANT
- DENOTES EXISTING HYDRANT
- DENOTES PROPOSED WATER VALVE & BOX
- DENOTES EXISTING WATER VALVE & BOX
- DENOTES PROPOSED WATER METER
- DENOTES PROPOSED SIAMESE CONNECTION
- 113.62 ×100.00 DENOTES EXISTING SPOT ELEVATION
- × (100.00) DENOTES PROPOSED ELEVATION
- × (100.00)T/C DENOTES PROPOSED TOP OF CURB ELEVATION
- × (100.00)G/L DENOTES PROPOSED GUTTER LINE ELEVATION
- × (100.00)B/C DENOTES PROPOSED BACK OF CURB ELEVATION
- × (100.00) HP DENOTES PROPOSED HIGH POINT
- × (100.00) DENOTES PROPOSED SWALE INVERT ELEVATION
- × [100.00] DENOTES PROPOSED ELEVATION BY OTHERS
- 1.0% DENOTES PROPOSED FLOW ARROW AND SLOPE
- DENOTES PROPOSED SWALE
- DENOTES EMERGENCY OVERLAND FLOW
- DENOTES DITCH OVERLAND DRAINAGE
- DENOTES PROPOSED SLOPE (3:1 OR HIGHER)
- 195.50 DENOTES EXISTING CONTOUR
- DENOTES PROPOSED SILT FENCE
- DENOTES LINES TO MATCH EXISTING GRADES
- DENOTES PROPOSED ENTRANCE LOCATION
- DENOTES EXTENT OF MAX. PONDING (0.30m) 100 YEAR STORM.
- DENOTES PROPOSED LIMIT OF CONSTRUCTION
- DENOTES PROPOSED HEAVY DUTY ASPHALT AREA
- DENOTES PROPOSED SUBDRAIN

CONTRACTOR TO PROVIDE AS-BUILT DRAWINGS COMPLED BY AN ONTARIO LAND SURVEYOR UPON COMPLETION OF ALL WORKS TO THE ODAN/DETECH GROUP



KEY PLAN
Scale : N.T.S.

SUBJECT LANDS

NOTES:

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EXISTING TOPOGRAPHICAL INFORMATION SUPPLIED BY SYLVESTER & BROWN LAND SURVEYING. DATED JULY 23, 2021.

BENCH MARK:

ELEVATIONS ARE GEODETIC, DERIVED BY RTK GPS OBSERVATIONS USING THE TOPNET REAL-TIME NETWORK SERVICE AND REFERRED TO CGVD28-1978 USING THE NRCAN HTV2.0 GEOID SEPARATION MODEL.

METRIC NOTE:

DISTANCES AND ELEVATIONS ON THIS PLAN ARE TYPICALLY SHOWN IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NO.	REVISIONS	DATE	BY
6	XXXXXXX	XXX-XX-23	Z.Z.
5	REISSUED FOR ZONING 2ND SUBMISSION	NOV-15-22	M.H.H.
4	~~REISSUED FOR ZONING 2ND SUBMISSION~~ (CANCELLED)	NOV-10-22	M.H.H.
3	ISSUED FOR REVIEW AND COORDINATION	FEB-11-22	G.V.
2	ISSUED FOR REVIEW AND COORDINATION	DEC-15-21	G.V.
1	ISSUED FOR REVIEW AND COORDINATION	DEC-01-21	G.V.

CLIENT :

NAUTICAL LANDS GROUP

29-62 CARP ROAD
CARP, ON. K0A 1L0

PROJECT:

PROPOSED RESIDENTIAL DEVELOPMENT

60 HENDERSON ST
PORT HOPE, ONTARIO

ODAN·DETECH
CONSULTING ENGINEERS

The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

SCALE:
0 5 10 20 30
1:300

DRAWING :
CONCEPTUAL SITE GRADING PLAN

21241 (PH)
(ZBA)

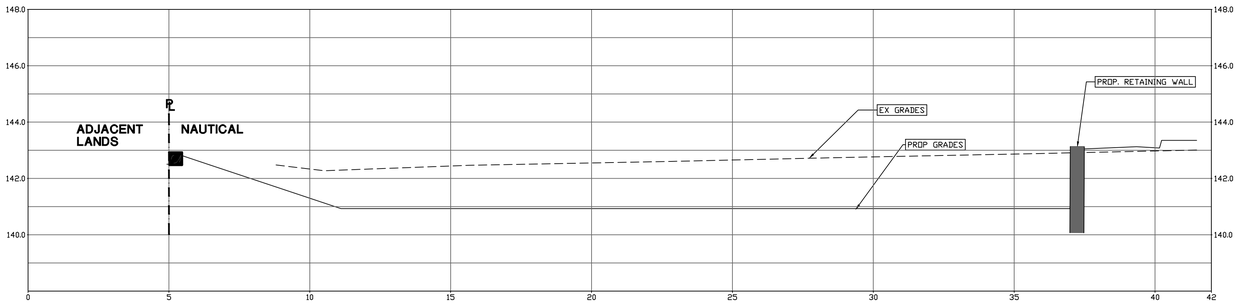
PROJECT NUMBER

APRIL 2023

DATE:

ENGINEER

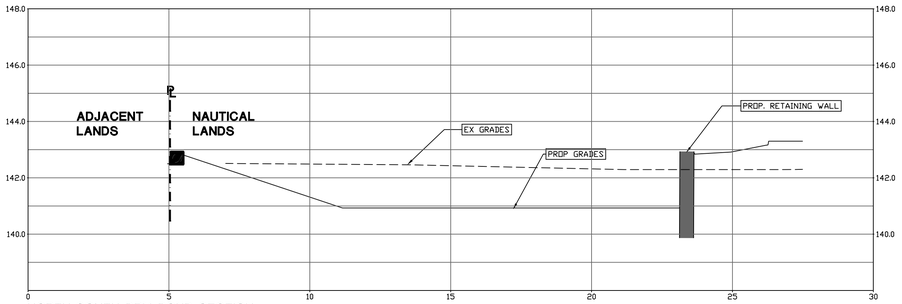
DESIGN BY: M.H.H.
DRAWN BY: Z.Z.
CHECKED BY: M.H.H.
APPROVED BY: P.H.
DRWG. NO.: 2 OF 3



EAST-WEST DRY POND SECTION
SCALE - 1:100

SECTION POND E-W

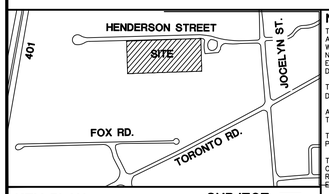
scale 1:100



NORTH-SOUTH DRY POND SECTION
SCALE - 1:100

SECTION POND N-S

scale 1:100



KEY PLAN
Scale : N.T.S.

SUBJECT LANDS

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CLIENT :

NAUTICAL LANDS GROUP

29-62 CARP ROAD
CARP, ON. K0A 1L0

PROJECT:

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5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

SCALE:
1:100 (0, 5, 10)

DRAWING : CROSS SECTIONS (ZBA)

21241 (PH) (ZBA)
PROJECT NUMBER

APRIL 2023
DATE:

ENGINEER

DESIGN BY: M.H.H.
DRAWN BY: Z.Z.
CHECKED BY: M.H.H.
APPROVED BY: P.H.
DRWG. NO.: 3 OF 3