Cominar

Site Servicing & Storm Water Management Report

800 Palladium Dr.

Client's project number: GA18-0631-01

CIMA+ file number: A000919
06-20-2019 Rev. 4

Cominar

Site Servicing & Storm Water Management Report

800 Palladium Dr.

Client's project number: GA18-0631-01

Prepared by: _____
Benjamin Tardioli, EIT.

Verified by: _____
Tim Kennedy, P.Eng.
P.E.O. membership number: 100173201

240 Catherine Street, Suite 110, Ottawa, Ontario
Canada K2P 2G8

CIMA+ file number: A000919
06-20-2019 Rev. 4

Confidentiality and Ownership

Notice to the Reader

This document was prepared by CIMA+ for:

Cominar
3400 boul. de Maisonneuve O, bureau 1600
Montréal, Québec
H3Z 3B8

The material included in this document reflects the opinion of CIMA+. Any use of this document, reference to it, or decision based on it by someone else will be their own responsibility. CIMA+ will not take any responsibility for damages resulting in decisions or actions taken by someone else based on this document.

Table of Contents

List of Tables

List of Appendices

1. Introduction

CIMA+ was retained by Cominar to prepare a Site Servicing and Stormwater Management Report in order to obtain Site Plan Approval for the construction of a 5-storey office building and associated surface parking lot located at 800 Palladium Drive, within the Palladium Development, in Ottawa, Ontario.

The site is located at the northeast quadrant of the intersection of Palladium Drive and Cyclone Taylor Blvd (refer to **Appendix A – Site Location Plan**). The site is currently a gravel surfaced special event parking lot for the Canadian Tire Centre (previously known as the Palladium), with curbed landscaped islands along the perimeter.

The detailed design of sediment and erosion control measures, site servicing (storm, sanitary, water) and grading, as well as measures for the control of stormwater runoff, are considered in this report, all in accordance with the Ottawa Sewer Design Guidelines (2012), the Ottawa Design Guidelines – Water Distribution (2010) and associated Technical Bulletins.

2. Design Objectives

The objective of this study is to assess current site servicing conditions through the review of available background documents and to present detailed concepts, calculations and results to provide adequate site servicing (i.e. watermain, storm sewer and storm water management, and sanitary sewer) for the new building and associated parking lot.

The following reports and plans have been reviewed to establish the site's design constraints:

+ Addendum to Final Stormwater Design Plan for the Ottawa Senators Palladium, NHL Arena Development by J.L. Richards & Associates Ltd., June 21 1994.

2.1 Summary of Applicable Background Documents

2.1.1 Addendum to Final Stormwater Design Plan for the Ottawa Senators Palladium, NHL Arena Development by J.L. Richards & Associates Ltd., June 21 1994.

This report addresses the management of storm water within the "Ottawa Senators Palladium NHL Arena Development" which includes the subject property of 800 Palladium (Refer to **Appendix B – JL Richards SWM Plan**). The objectives of the stormwater design plan (SDP) were to:

+ maintain water quality and quantity in the Carp River;
+ identify erosion and sedimentation measures to be utilized during and after construction;
+ incorporate a vegetative buffer strip between the Carp River and any development;
+ recommend a stormwater management scheme which will prevent the aggravation of flooding and erosion along the Carp River; and
+ protect and enhance aquatic habitat of the Carp River.

The objectives of the SDP were achieved through the development of a storm water management pond located to the east of the subject site. The pond is a wet pond designed to provide quality control for the first 10 mm of runoff (first flush) with a 72-hour detention time for the entire Palladium development. Quantity control (storage) of storm water is also provided within the existing wet pond for Block 1 and all roadways for the development (refer to **Appendix C – Legal Survey Blocks**). The flow volume above the first 10 mm is released through two overflow structures consisting of 1.10 m wide weirs at an elevation of 93.20 m located in two oversized manholes. This will ensure that runoff from the Palladium site will be released prior to peak flows in the Carp River reaching the Palladium pond outlet.

The remaining blocks within the Palladium development were to provide quantity control via "on-site storage using a combination of surface ponding, and/or underground storage and/or rooftop storage in order to limit the inflow into the pipe network to the pre-determined levels." The subject site falls within Block 11 of the Palladium development and thus is subject to these on-site quantity control requirements.

3. Storm Water Management

3.1 Existing Conditions

As previously mentioned, the subject site of 800 Palladium is currently a gravel surfaced parking lot used for special events at the Canadian Tire Centre. The site generally slopes from south to north with an approximate grade change of 1 m across the site. Major system overland flows are currently directed to the existing site entrances to the north and east, and are ultimately conveyed to the existing storm water management pond to the east before discharging to the Carp River (refer to **Appendix B – JL Richards SWM Plan**).

The majority of the minor system flows are currently captured by a series of catch basins within the parking lot and conveyed to an existing 1050 mm diameter municipal storm sewer running west to east along Palladium Drive. These minor system flows are ultimately conveyed to the existing storm water management pond to the east before discharging to the Carp River. A small area of the site drains to the existing private storm sewer system to the north.

3.2 Pre-development Conditions

The subject site is located within the J.L. Richards sub-basins S21, S24 and N23 (refer to **Appendix B – JL Richards SWM Plan**). The total allowable release rate for each of these sub-basins in order to limit the inflow into the pipe network is provided in Table 4 of the J.L. Richards Report and they are 42 L/s, 21 L/s and 42 L/s respectively (refer to **Appendix D – JL Richards Release Rate Summary**).

The total allowable release rate for the proposed development was determined on a pro rata basis for the proposed site areas within each sub-basin. Thus, the allowable release rate for the proposed site is as follows:

$RR_{(800\ Palladium)} = RR_{(S21)} *(A_{(800\ Palladium\ -\ S21)}/A_{(S21)}) + RR_{(S24)} *(A_{(800\ Palladium\ -\ S24)}/A_{(S24)}) + RR_{(N23)} *(A_{(800\ Palladium)}/A_{(N23)})$

$RR_{(800\ Palladium)}$ = 42 L/s * (0.7 ha/0.7 ha) + 21 L/s (0.29 ha/0.68 ha) + 42 L/s (0.14 ha/1.06 ha)

$RR_{(800\ Palladium)}$ = 42 L/s + 9 L/s + 5.5 L/s

$RR_{(800\ Palladium)}$ = 56.5 L/s (for both the 5 and 100 year rainfall events)

Given noted issues regarding storm water servicing with the lands to the north, the allowable site release rate will be limited to the allowance in the JL Richards report that was directed to the south cell of the downstream stormwater management facility.

Thus, the allowable release rate under post-development conditions will not account for flows to the north (Area N23) and will be limited to the following pre-determined levels as outlined in the J.L. Richards report:

$RR_{(800\ Palladium)} = RR_{(S21)} *(A_{(800\ Palladium\ -\ S21)}/A_{(S21)}) + RR_{(S24)} *(A_{(800\ Palladium\ -\ S24)}/A_{(S24)})$

$RR_{(800\ Palladium)}$ = 42 L/s * (0.7 ha/0.7 ha) + 21 L/s (0.29 ha/0.68 ha)

$RR_{(800\ Palladium)}$ = 42 L/s + 9 L/s

$RR_{(800\ Palladium)}$ = **51 L/s** (for both the 5 and 100 year rainfall events)

3.3 Post-development Conditions

3.3.1 Design Criteria

The design of the major and minor storm systems will ensure that the following design criteria are upheld under post-development conditions, in keeping with the requirements of the J.L. Richards Report:

+ Quality control of storm water will be achieved in the existing storm water management pond;
+ All minor system flows will be directed to the existing 1050 mm storm sewer along Palladium Drive. This will ensure all proposed storm sewers are connected to the municipal sewer network with no minor system flows directed to the private sewer system to the north;
+ Only those allowable pre-development flows associated with the proposed development areas will be directed to the municipal storm network to limit the inflow into the pipe network to the pre-determined levels under post-development conditions;
+ Of the 51 L/s total allowable release rate, 6.5 L/s is currently released from an ICD in the existing catch basins at the intersection of the Private Access Road with Palladium Drive. Thus, the total remaining available release rate for the proposed development is 44.5 L/s;
+ Flows in excess of the maximum allowable release rate to the Palladium Drive storm sewer network will be stored on-site using a combination of surface ponding, and/or underground storage and/or rooftop storage;
+ Maximum ponding depth in the parking area will be limited to a maximum of 300 mm;
+ Storage within the parking areas will be achieved through the use of inlet control devices;
+ Roof storage will be provided through the use of controlled roof drains;
+ Overland major system flows for those storm events in excess of 100-year will be directed to the private drive to the east.

3.3.2 Methodology and Calculations

As defined in the City of Ottawa Sewer Design Guidelines (2012), the Rational Method is a valid approach to determination of peak flows and pipe capacity for drainage areas of less than 40 ha in size. Thus, the Rational Method has been used in the determination of required storage volumes and inlet control device (ICD) sizing requirements to store the 2-year, 5-year and 100-year storm events to the pre-determined allowable release rates in accordance with the requirements of the J.L. Richards Report.

Runoff Coefficients

The following runoff coefficients presented in **Table 3-1** are used in the calculations for post development release rates. For the 100-year event 25% was added to the C value in accordance with the Ottawa Sewer Design Guidelines (2012) (refer to **Appendix E – SWM and Storm Sewer Design Calculations**):

Table 3-1: Post-development Runoff Coefficients (5-year and 100-year)

POST-DEVELOPMENT RUNOFF COEFFICIENTS							
Sub-Catchment Area ID	Grassed Area (m2)	Grassed Area Runoff Coefficient	Hard Surface Area (m2)	Hard Surface Runoff Coefficient	Total Area	Weighted Runoff Coefficient (5-year event)	Factored Runoff Coefficient (100-year event)
A	225	0.20	1597	0.90	1822	0.81	0.95
B	218	0.20	1504	0.90	1722	0.81	0.95
C	74	0.20	1297	0.90	1371	0.86	0.95
D	18	0.20	1135	0.90	1153	0.89	0.95
E	219	0.20	1250	0.90	1469	0.80	0.95
F	198	0.20	1159	0.90	1357	0.80	0.95
G	236	0.20	90	0.90	326	0.39	0.49
H	0	0.20	59	0.90	59	0.90	0.95
I	116	0.20	0	0.90	116	0.20	0.25
J	23	0.20	59	0.90	82	0.70	0.88
K	0	0.20	24	0.90	24	0.90	0.95
L	22	0.20	64	0.90	86	0.72	0.90
M	151	0.20	0	0.90	151	0.20	0.25
BLDG	0	0.20	2786	0.90	2786	0.90	0.95

Allowable Release Rate

As previously mentioned only those allowable pre-development flows associated with the proposed development area identified as draining to the south cell of the downstream stormwater management pond will be utilized to limit the inflow into the pipe network to the pre-determined levels under post-development conditions. Thus, the total allowable release rate for the site is presented in **Table 3-2** below:

Table 3-2: Post-development Allowable Release Flows (5-year and 100-year)

POST-DEVELOPMENT TOTAL ALLOWABLE RELEASE FLOWS	
Catchment Area ID	**Allowable Release Flow (L/s)**
S21	42.00
S24	9.00
Existing flow from Private Access Road	- 6.50
Total	44.50

Thus, the post-development runoff generated from the areas to be developed and directed to the municipal storm sewers must be controlled to a total allowable release rate of 44.50 L/s.

Release Rate Summary (5-year and 100-year events)

Utilizing the IDF rainfall data taken from the MacDonald Cartier Airport, collected 1966 to 1997, per the Ottawa Sewer Design Guidelines (2012), the following release rates have been determined for the individual sub-catchment areas as outlined in **Table 3-3** below (refer to **Appendix E – SWM and Storm Sewer Design Calculations**):

Table 3-3: Post-development Sub-Catchment Release Rates

POST-DEVELOPMENT RELEASE FLOW SUMMARY		
Sub-Catchment Area ID	**Total Area (m2)**	**Release Flow (L/s)**
A	1822	6.85
B	1722	6.48
C	1371	5.21
D	1153	4.38
E	1469	5.58
F	1357	5.16
G	326	0.98
H	59	0.18
I	116	0.35
J	82	0.25
K	24	0.07
L	86	0.26
M	151	0.45
BLDG	2786	8.30
Total	**12506**	**44.50**

As demonstrated in **Table 3-3** above, the total runoff generated from the developed areas will be restricted to the allowable release rate outlined in the J.L. Richards Report up to and including the 100-year design event. This will be accomplished through the use of inlet control devices and controlled roof drains.

Inlet Control Devices

There are three existing outlets from the site which convey runoff to the municipal storm sewer system and ultimately to the south cell of the stormwater management pond. An ICD will be required at each outlet in order to provide the required on-site storage.

The following **Table 3-4** outlines the parameters for ICD sizing (refer to **Appendix E – SWM and Storm Sewer Design Calculations**). Due to the inclusion of underground storage, only Vortex type inlet control devices can be used on this site.

Table 3-4: Inlet Control Devices

ICD №	Sub-Catchment Area Controlled	MH / CB №	Pipe	Max Flow (L/s)	Max Head (m)	Type
1	A, B	CBMH-4	250	13.33	1.58	Vortex
2	C, D, E, F	CBMH-5	250	20.33	1.62	Vortex
3	G, H, I, J, K, L, M, BLDG	MH-3	250	10.84	1.99	Vortex

Storage Requirements (2-year, 5-year and 100-year events)

Where the pre-determined allowable release rate outlined in the J.L. Richards Report is exceeded, storage will be provided on-site up to and including the 100-year storm event using a combination of surface ponding, underground storage and rooftop storage. **Table 3-4** below (refer to **Appendix E – SWM and Storm Sewer Design Calculations**) provides the required storage for the 2, 5- and 100-year storm events.

Table 3-5: Storage Requirements

POST-DEVELOPMENT STORAGE REQUIREMENT SUMMARY			
Sub-Catchment Area ID	Required Storage Capacity 2-year event (m3)	Required Storage Capacity 5-year event (m3)	Required Storage Capacity 100-year event (m3)
A	17.49	27.46	72.07
B	16.53	25.95	68.12
Total	**34.03**	**53.40**	**140.19**
C	14.37	22.43	54.04
D	12.74	19.84	45.45
E	13.74	21.94	57.91
F	12.70	19.99	53.49
Total	**53.55**	**83.90**	**210.90**
G	1.08	1.80	5.66
H	0.75	1.14	1.20
I	0.10	0.19	0.74

J	0.71	1.11	3.16
K	0.3	0.46	1.02
L	0.78	1.21	3.41
M	0.12	0.25	0.97
BLDG	34.96	53.49	117.96
Total	**38.80**	**59.66**	**134.12**

Available Storage

As per City of Ottawa Technical Bulletin PIEDTB-2016-01, surface ponding is not permitted up to the 2-year storm event in parking areas. The existing downstream stormwater management pond was not designed to provide storage for the 2-year event, thus underground storage must be provided in order to limit the release rate to pre-determined allowable release rate outlined in the J.L. Richards Report. Storm events up to and including the 100-year storm event will be stored on-site through a combination of underground retention and surface storage.

It is important to note that the available storage on the building roof is not sufficient to store the 100-year event. Thus, the difference between the available roof storage volume and the required storage volume will be provided via underground retention.

The allowable roof drain flows and required storage have been coordinated with the building mechanical engineer (refer to **Appendix F - Stormwater Management Plan**).

Table 3-6 below summarizes the available storage for all areas (refer to **Appendix E – SWM and Storm Sewer Design Calculations**).

Table 3-6: Post-development Sub-Catchment Available Storage Summary

POST-DEVELOPMENT AVAILABLE STORAGE SUMMARY					
Outlet for Sub-Catchment Group	**Sub-Catchment Area ID**	**Available Parking Storage Capacity (m3)**	**Available Rain garden / Roof Surface storage**	**Available Underground Storage (m3)**	**Total Available Storage (m3)**
ICD#1	A	52.08	-	-	52.08
	B	132.6	26	9.5	168.10
	Total	**184.68**	**26**	**9.5**	**220.18**
ICD#2	C	52.59	-	-	52.59
	D	69.33	-	-	69.33
	E	0.49	-	-	0.49
	F	29.47	13.0	47.0	89.47
	Total	**151.88**	**13.0**	**47.0**	**211.88**
ICD#3	G	-	-	-	0.00
	H	-	-	-	0.00
	I	-	-	-	0.00
	J	-	-	-	0.00
	K	-	-	-	0.00
	L	-	-	-	0.00
	M	-	25.33	-	25.33
	BLDG	-	57.55	61.6	119.15
	Total	**-**	**82.88**	**61.6**	**144.48**

Each ICD will provide a controlled outlet flow with multiple sub-catchment areas draining to each ICD as outlined in **Table 3-6** above. The ICD will first backflow into the available underground retention ponds prior to any ponding occurring on the surface, with surface ponding accumulating to a common elevation for all areas associated with each ICD. **Table 3-7** below depicts the volume of surface ponding after each rainfall event (refer to **Appendix E – SWM and Storm Sewer Design Calculations**).

Table 3-7: Post-development Storage Summary

POST-DEVELOPMENT STORAGE								
Outlet for Sub-Catchment Group	Available Parking Surface Storage (m3)	Available Rain Garden/ Roof / Underground Storage (m3)	Required Storage 2-year (m3)	Remaining Volume on Surface (m3)	Required Storage 5-year (m3)	Remaining Volume on Surface (m3)	Required Storage 100-year (m3)	Remaining Volume on Surface (m3)
ICD#1 (A,B) *Parking Area*	184.68	35.5	34.03	0	53.40	17.9	140.19	104.69
ICD#2 (C,D,E,F) *Parking Area*	151.88	60.0	53.55	0	83.90	23.9	210.90	150.90
ICD#3 (D,H,I,J, K,L,M, BLDG)	0	144.48	38.80	0	59.66	0	134.12	0
Total Volumes	576.54		126.38		240.76		485.21	

As shown in **Table 3-7** above, adequate underground storage will be provided for the 2-year event with a combination of underground and surface storage provided for the 100-year event.

Table 3-8 below summarizes the associated drawdown time for surface ponding during each design storm (refer to **Appendix E – SWM and Storm Sewer Design Calculations**).

Table 3-8: Post-development Ponding Height and Drawdown Summary

DRAWDOWN SUMMARY						
Outlet for Sub-Catchment Group	Ponding Height, Y_{rain} (m) 2-year	Drawdown Time (min) 2-year Event	Ponding Height, Y_{rain} 5-year	Drawdown Time (min) 5-year Event	Ponding Elevation, Y_{rain} 100-year	Drawdown Time (min) 100-year Event
ICD#1 (A,B) *Parking Area*	0	0	95.64	23	95.78	131
ICD#2 (C,D,E,F) *Parking Area*	0	0	95.65	20	95.90	124
``ICD#3 (D,H,I,J,K,L,M, BLDG)	-	-	-	-	-	-

Overland Flow

Excess flow from a rainfall event greater than a 100-year storm event will be conveyed via overland flow for each drainage area as demonstrated on the Storm Drainage Plan (refer to **Appendix F – SWM Plan**), with the outlet from the site located at the easterly vehicle access. Overland from the site will then be conveyed along the private access road and through the private lands to the east towards the existing wet pond.

Stormwater Quality Control

As previously mentioned, the quality control of storm water will be achieved in the existing storm water management pond in accordance with the J.L. Richards Report.

Building Service Connection

A 200 mm storm sewer service connection will be provided along the south side of the building extending to the westernmost storm sewer lateral which connects to Palladium Drive (refer to **Appendix G – Site Servicing Plan**).

In accordance with the Ottawa Sewer Design Guidelines (2012) a monitoring maintenance hole will be provided along the storm sewer service connection as close as possible to the property line. The monitoring maintenance hole (STM MH-3) is located in the patio area south of the building.

4. Watermain

4.1 Existing Conditions

There is an existing 300 mm PVC municipal watermain running east-west along Palladium Drive. There is also an existing 150 mm PVC private watermain extending from Palladium Drive and running along the Private Access Road to the east of the site, with a capped stub extending from the Private Access into the site (refer to **Appendix G – Site Servicing Plan**)

There is an existing valve located on the 150 mm PVC watermain stub just off of the main running along the Private Access Road.

Furthermore, there are two existing fire hydrants within the site limits located to the north of Palladium Drive and another to the west of Cyclone Taylor Blvd.

4.2 Service Connection Data

The water entry room is located centrally along the east side of the proposed building.

A new 200 mm service connection will be provided from the water entry room to the 150 mm watermain service connection stub provided for the site to the east. A reducer will be installed to accommodate the reduction in diameter.

Given the length of the watermain building connection, utilizing a 150 mm diameter pipe would result in unacceptable pressure losses due to friction, leading to an operating pressure which does not maintain minimum requirements. Thus, the 200 mm diameter pipe was selected.

4.3 Water Demands (Domestic and Fire Protection)

The following water demands and fire flow requirements have been determined in the accordance with the Ottawa Design Guidelines – Water Distribution (2010) and the Fire Underwriters Survey (1999) respectively (refer to **Appendix H – Watermain Design Calculations**).

Table 4-1: Water Demands (Ottawa Design Guidelines – Water Distribution (2010))

DOMESTIC WATER DEMANDS – CITY GUIDELINES	
Demand Type	**Total**
Average Daily Demand	0.45 L/s (7.14 USgpm)
Maximum Daily Demand	0.68 L/s (10.71 USgpm)
Maximum Hourly Demand	1.22 L/s (19.28 USgpm)

CIMA+ determined a fire flow demand of 116.7 L/s (1849 USgpm) in accordance with the Fire Underwriters Survey (1999) (refer to **Appendix H – Watermain Design Calculations**).

4.4 Boundary Conditions and Residual Pressure Analysis:

The City of Ottawa provided the following boundary conditions at the connection point along Palladium Drive given the provided domestic water demands and fire flow noted above (refer to **Appendix H – Watermain Design Calculations**):

Table 4-2: Boundary Conditions (Provided by the City of Ottawa)

DOMESTIC WATER DEMANDS – CITY GUIDELINES		
Demand Scenario	**Head (m)**	**Pressure (psi) (@ El. 95.97 m)**
Maximum HGL	162.0	93.8
Peak Hour	157.4	87.3
Max Day Plus Fire (7,000) L/min	158.8	89.4

In accordance with the Ottawa Design Guidelines – Water Distribution, the minimum and maximum water pressures as well as flowrates must conform to the following objectives:

+ In accordance with the MOE guideline, it is generally accepted best practice to design new water supply and distribution systems such that the normal operating pressure ranges between 350 kPa (50 psi) and 480 kPa (70 psi) under a condition of maximum daily flow;
+ In accordance with MOE Guidelines, the distribution system shall be sized so that under maximum hourly demand conditions the pressures are not less than 276 kPa (40 psi.);
+ Where fire flow has been provided; during periods of maximum day and fire flow demand the residual pressure at any point in the distribution system shall not be less than 140 kPa (20 psi.);
+ In accordance with the Ontario Code & Guide for Plumbing, the maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi.);

The following **Table 4-3** provides a summary of the water pressures for each objective noted above (refer to **Appendix H – Watermain Design Calculations**):

Table 4-3: Residual Water Pressure Analysis under the Various Demand Objectives

RESIDUAL WATER PRESSURE ANALYSIS				
Demand Scenario	**Start Head (m)**	**Friction and Elevation Losses (m)**	**Residual Head (m)**	**Residual Pressure (psi)**
Maximum Day	66.03	0.28	65.75	93.49
Peak Hour	61.43	0.28	61.15	86.95
Max Day Plus Fire	62.83	27.63	35.20	50.05

As demonstrated in Table 4-3 the minimum water pressure demands under each demand scenario is respected. However, the maximum pressure exceeds 70 psi under a condition of maximum daily flow and thus a pressure reducing valve will be required for the proposed building.

4.5 Fire Protection

There are existing fire hydrants along Palladium drive and Cyclone Taylor Blvd. However, the building Siamese connection and fire route will be located along the buildings' east façade. Given neither of the existing hydrants are location within 45 m of the proposed Siamese location, an additional hydrant will be provided to the east of the building within the parking, thus providing adequate coverage for the proposed building.

5. Sanitary Sewers

5.1 Existing Conditions

There is an existing 250 mm municipal sanitary sewer running north-south along Cyclone Taylor Boulevard just west of the site. There is also an existing capped private sanitary sewer extending from the Private Access to the east into the site (refer to **Appendix G – Site Servicing Plan**).

It is preferable to connect to the existing municipal sewer to the west for the following reasons:

+ Cost savings associated with a shorter and direct connection to the existing municipal sewer;
+ The ability to confirm available capacity of the existing municipal sewer to accommodate flows from the proposed development with the City directly;
+ Eliminates the possible need for Ministry of Environment, Conservations and Parks (MECP) approval in relation to the connection of multiple parcels of land to a private sewer network.

However, due to the fact that there is an existing private sanitary sewer plug to the east, planned to service the site as part of a previous development, the City of Ottawa has requested that the proposed development connect at this location.

5.2 Service Connection Data

A 200 mm sanitary sewer service connection will be provided extending from the east side of the proposed building to the existing private, capped sanitary sewer connection in the northeast corner of the site (refer to **Appendix G – Site Servicing Plan**).

In accordance with the Ottawa Sewer Design Guidelines (2012) a monitoring maintenance hole will be provided along the sanitary sewer service connection just inside the property line.

In order to connect to the existing capped sewer and provide adequate cover, a maximum available slope of 1.5% was possible based on the existing invert elevation. With this slope, minimum flow velocity is not achieved for self cleansing (refer to **Appendix I – Sanitary Sewer Design Calculations**). It is recommended that Cominar implement a maintenance/flushing program for the sanitary sewer in order to ensure it functions properly. It is recommended that inspections of the sanitary sewer be completed on a bi-annual basis and flushing is completed annually.

5.3 Sanitary Sewer Flows

The following sanitary flow has been determined in the accordance with the Ottawa Sewer Design Guidelines (2012) and Technical Bulletin ISTB-2018-01.

CIMA+ determined the sanitary sewer flow using an average commercial design base flow of 28000 L/gross ha/day and an ICI Peak Factor of 1.5. The calculated peak flow for the site is **1.19L/s.** Extraneous flows are included for the catchment areas (B, C, D) in the parking lot directly over the sewer and the grass area around the maintenance hole. The total peak flow including extraneous flow is **1.35 L/s** (refer to **Appendix I – Sanitary Sewer Design Calculations**).

The private sewer has been sized as part of a previous adjacent development to accept the sanitary flows from the proposed development. Given a building of similar size and use was utilized to design the adjacent development, it is assumed that there is sufficient capacity available in this private sewer to accept these moderate flows.

6. Sediment and Erosion Control

Appropriate measures must be taken to control erosion and sedimentation during the construction process for the proposed development. Sediment will be trapped on site, implementing the Ontario Ministry of Natural Resources and Forestry's (MNRF) "Guidelines on Erosion and Sediment Control for Urban Construction Sites," in order to assure proper control measures are upheld. Furthermore, the following measures must be taken into account:

+ Supply and install silt fences (as per OPSD 219.110) along the perimeter of the impacted lands, including borrow and stockpile areas resulting from topsoil stripping or excavating activities; locations determined during field grading operations;
+ Catch basin inserts must be used within the limits of the project and must remain in place until project completion. The inserts must also be inspected regularly and corrected as deemed necessary;
+ A dewatering system, such as a sedimentation basin or approved equivalent, shall be implemented to filter sediments from an excavated trench should dewatering and pumping operations become necessary, all in accordance with the City of Ottawa Sewer Use By-Law 2003-514.

All control measures will be carried out in accordance with the following documents:

+ "Guidelines on Erosion and Sediment Control for Urban Construction Sites" published by Ontario Ministries of Natural Resources, Environment, Municipal Affairs and Housing, and Transportation and Communication, Association of Construction Authorities of Ontario, and Urban Development Institute, Ontario, May 1987.
+ "Erosion and Sediment Control" Training Manual by Ministry of the Environment, Spring 1998.
+ Applicable Regulations and Guidelines of the Ministry of Natural Resources and Forestry.

Refer to **Appendix I**, Sediment and Erosion Control Plan (C004) and Notes Plans (C005 and C006) for additional information.

7. Conclusion

The current study demonstrates that the existing municipal services at the perimeter of the site are sufficient to service the proposed development.

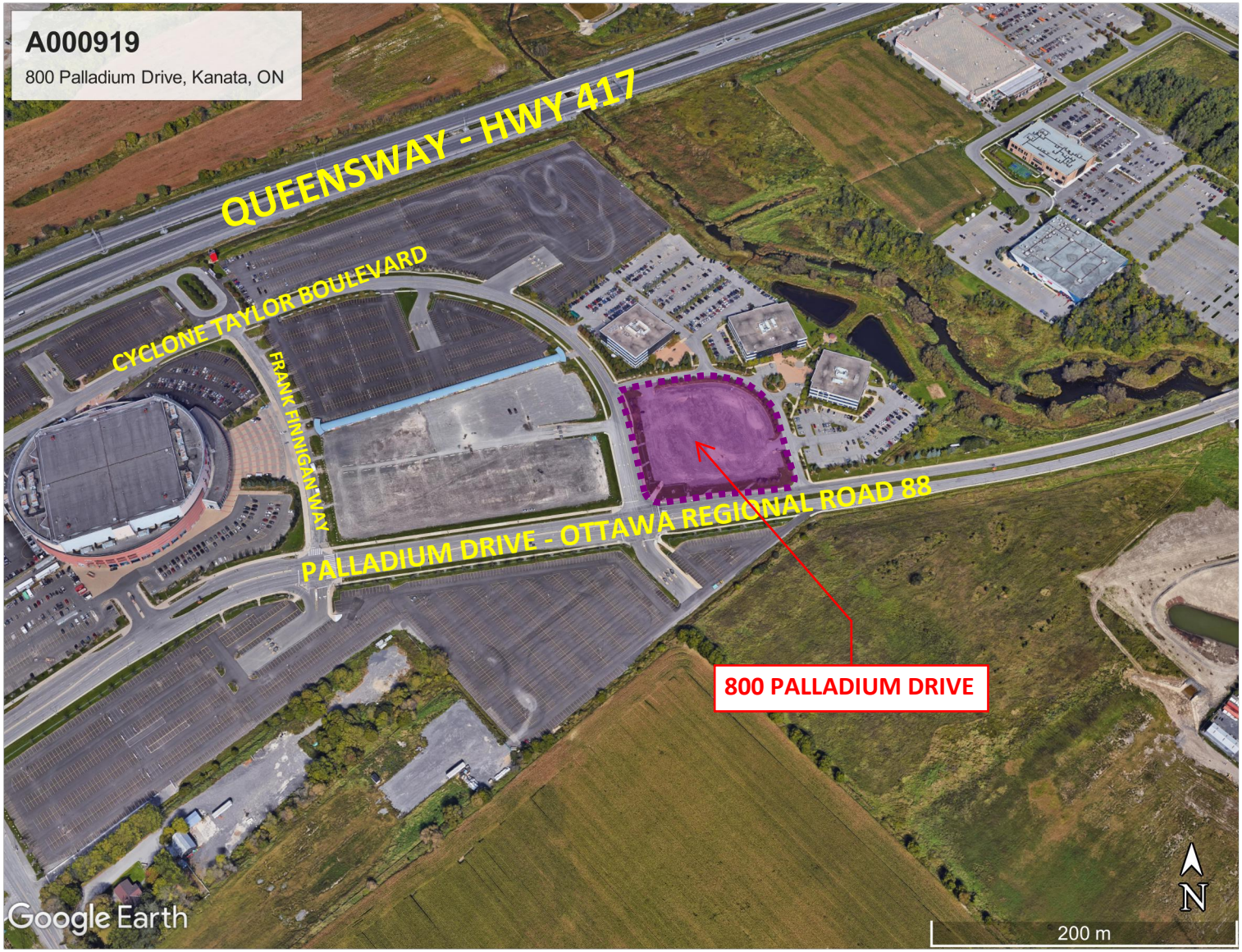
Within the site, all services have been designed in keeping with the City of Ottawa design requirements and the requirements of the J.L. Richards Report.

We trust this site servicing and stormwater management report is to your satisfaction. If you have any questions regarding this report, please do not hesitate to contact the undersigned.

CIMA+ *Partners in Excellence*

A

Appendix A -
Site Location Plan



Projet/Titre:
Project/Title:

A000919 – 800 PALLADIUM DRIVE

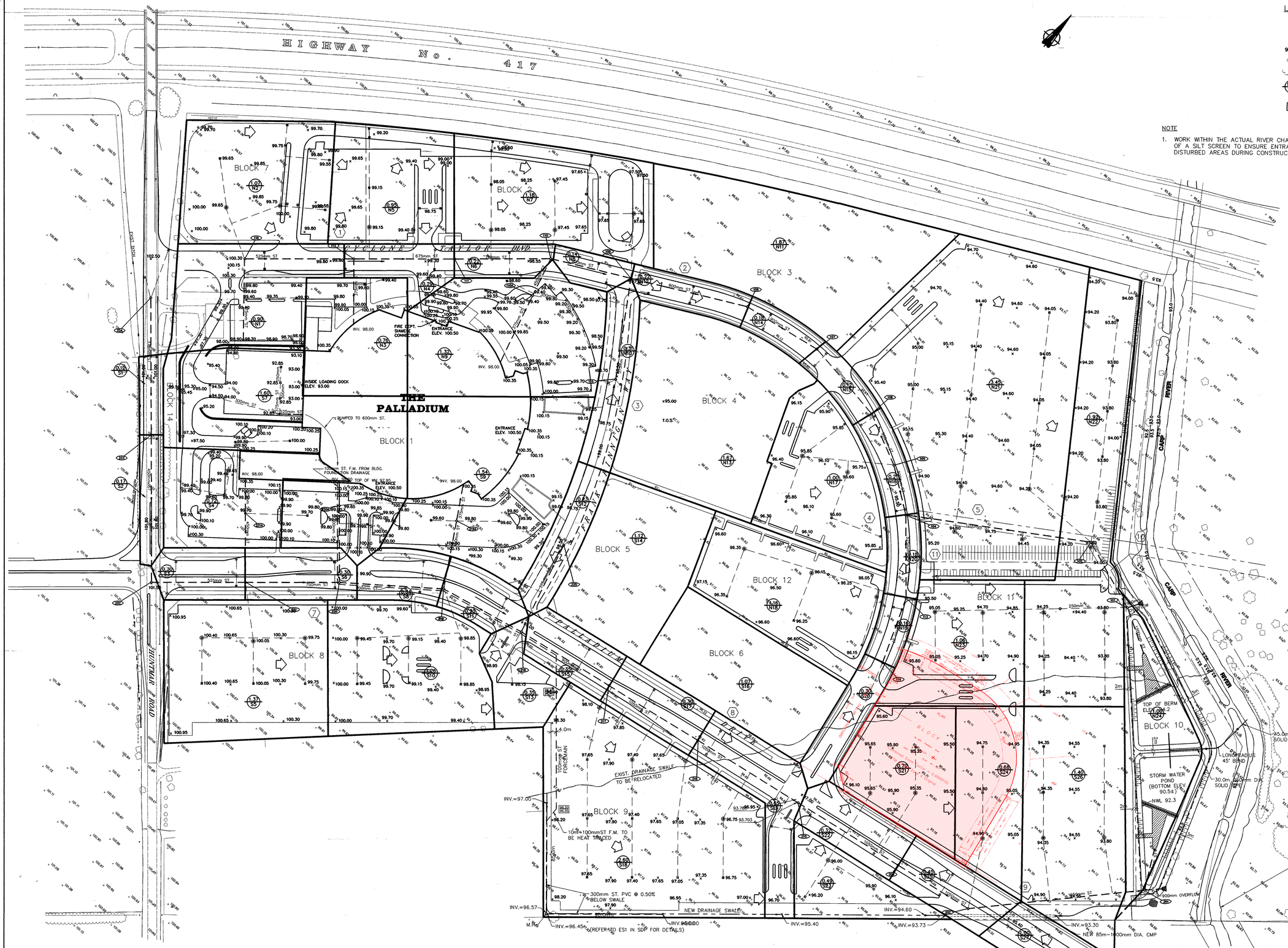
KEY PLAN

CIMA+

Dessiné par: Drawn by: J. ADAMS	Contrat no.: Contract no.: AP18021	Dessin no.: Drawing no.: N/A
Conçu par: Designed by: J. ADAMS	Date: 2019-02-27	
Vérifié par: Verified by:	Echelle: Scale: N/A	

B

Appendix B -
JL Richards Storm Water Management Plan



LEGEND:

- CATCH BASIN
- CATCH BASIN EQUIPPED WITH SCEPTER TYPE 'A' ICD.
- 93.80 EXISTING ELEVATION
- 93.80 PROPOSED GRADE
- EXISTING TREE
- EXISTING BUSH
- AREA IN HECTARES SUB-BASIN I.D.
- MAJOR OVERLAND FLOW ROUTE

NOTE

1. WORK WITHIN THE ACTUAL RIVER CHANNEL WILL REQUIRE THE USE OF A SILT SCREEN TO ENSURE ENTRAPMENT OF ALL SEDIMENT IN DISTURBED AREAS DURING CONSTRUCTION.

EDITED BY JAYMESON ADAMS, EIT
A000919
2019-02-28

RECORD DRAWING
AMENDED ON BASIS OF FIELD MEASUREMENTS
DATE DEC., 1995
J. L. RICHARDS & ASSOCIATES LIMITED

NO.	REVISION	DATE
4.	AS CONSTRUCTED INFO ADDED	18/12/95
3.	REVISED PER CITY OF KANATA	07/03/94
2.	FINAL SDP SUBMISSION	22/06/92
1.	REVISED FOR FINAL SDP	04/06/92

NO.	ISSUE	DATE
1.	ISSUED FOR SITE PLAN APPROVAL	06/03/92

REGISTERED PROFESSIONAL ENGINEER
D. G. SHILLINGTON
PROVINCE OF ONTARIO

J.L.Richards & Associates Limited
Consulting Engineers, Architects & Planners
864 LADY ELLEN PLACE, OTTAWA, CANADA K1Z 5M2

TERRACE INVESTMENTS LTD.
AND
ROSSETTI ASSOCIATES ARCHITECTS

PROJECT:
THE PALLADIUM
SITE DEVELOPMENT

DRAWING:
STORM WATER MANAGEMENT
GRADING PLAN
(TERRACE SITE)

DESIGN:	D.G.S.	REVISION NO.:	
DRAWN:	R.L.O.	DRAWING NO.:	
CHECKED:	D.G.S		11535 SDP-3
DATE:	MAR. 1992	JOB NO.:	11535-07
SCALE:	1:1000		

12237

C:\11535\SDP3.25.40.94/04/05.10: 40

C

Appendix C -
Legal Survey – Overall Palladium Development

2-1-222

This plan is approved by the Ontario Municipal Board pursuant to section 50(20) of the Planning Act, 1983

Dated this 22nd day of June 1992

SECRETARY

PLAN 4M- 818

I CERTIFY THAT THIS PLAN 4M-818 IS REGISTERED IN THE LAND REGISTRY OFFICE FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON Nº4 AT 10:10 O'CLOCK ON Tuesday THE 23 DAY OF June 1992 AND ENTERED IN THE REGISTER FOR PARCEL Plan SECTION 4M818 AND REQUIRED CONSENTS AND AFFIDAVITS ARE REGISTERED AS PLAN DOCUMENT Nº 776083

"M. Chupick" Cert. Off.
LAND REGISTRAR

THE SUBDIVISION REPRESENTED BY THIS PLAN AFFECTS ALL OF PARCELS 2-1 AND 2-2, SECTION MARCH-1

PLAN OF SUBDIVISION OF

PART OF LOT 2
CONCESSION 1
TOWNSHIP OF MARCH
NOW IN THE CITY OF KANATA
REGIONAL MUNICIPALITY OF
OTTAWA - CARLETON
SCALE 1 : 2000
JOHN H KENNEDY O.L.S.
1992

SCALE 1 : 2000

0 10 20 30 50 100 150 150m
METRES

METRIC

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

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE THEREUNDER ;
2. THE SURVEY WAS COMPLETED ON THE 15th DAY OF JUNE, 1992.

JUNE 15, 1992
DATE

John H Kennedy
JOHN H. KENNEDY
ONTARIO LAND SURVEYOR

OWNER'S CERTIFICATE

THIS IS TO CERTIFY THAT :

1. BLOCKS 1 TO 12 BOTH INCLUSIVE, THE STREETS NAMELY PALLADIUM DRIVE, CYCLONE TAYLOR BOULEVARD AND FRANK FINNIGAN WAY AND THE ROAD WIDENINGS NAMELY BLOCKS 13 AND 14 HAVE BEEN LAID OUT IN ACCORDANCE WITH OUR INSTUCTIONS.
2. THE STREETS NAMELY CYCLONE TAYLOR BOULEVARD AND FRANK FINNIGAN WAY ARE HEREBY DEDICATED TO THE CORPORATION OF THE CITY OF KANATA AND THE STREET NAMELY PALLADIUM DRIVE AND THE ROAD WIDENINGS NAMELY BLOCKS 13 AND 14 ARE HEREBY DEDICATED TO THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON AS PUBLIC HIGHWAY.

DATED THE 16th DAY OF JUNE 1992

TERRACE INVESTMENTS LIMITED

BRUCE M. FIRESTONE
CHAIRMAN

I have the authority to bind the Corporation

NOTES

BEARINGS SHOWN HEREON ARE ASTRONOMIC, DERIVED FROM THE BEARING N41°32'00"W AS SHOWN FOR THE WESTERLY LIMIT OF THE ROAD ALLOWANCE BETWEEN THE TOWNSHIPS OF HUNTLEY NOW WEST CARLETON AND MARCH NOW CITY OF KANATA ON PLAN 5R-14184

LEGEND

□	DENOTES	SURVEY MONUMENT PLANTED
■	DENOTES	SURVEY MONUMENT FOUND
SIB	DENOTES	STANDARD IRON BAR
SSIB	DENOTES	SHORT STANDARD IRON BAR
IB	DENOTES	IRON BAR
Ø	DENOTES	ROUND
CC	DENOTES	CUT CROSS
WIT	DENOTES	WITNESS
ACC	DENOTES	ACCEPTED
MEAS	DENOTES	MEASURED
INST	DENOTES	INSTRUMENT
x—x	DENOTES	FENCE
(SU)	DENOTES	SOURCE UNKNOWN
(725)	DENOTES	ARNETT, KENNEDY, RIDDELL & JASON SURVEYING Ltd.
(JDB)	DENOTES	J.D.BARNES LTD.
(AOG)	DENOTES	ANNIS, O'SULLIVAN & GOLTZ LTD.
(857)	DENOTES	FAIRHALL, MOFFATT & WOODLAND LIMITED
(MTO)	DENOTES	MINISTRY OF TRANSPORTATION OF ONTARIO
(1442)	DENOTES	JOHN H. KENNEDY LTD.
(P1)	DENOTES	PLAN 5R-190
(P2)	DENOTES	PLAN 4R-7155

ALL FOUND MONUMENTS ARE PER (857) FAIRHALL, MOFFATT AND WOODLAND LIMITED UNLESS OTHERWISE NOTED.

CURVE SCHEDULE

LOT	RADIUS	ARC	CHORD	BEARING
1	455.48	223.02	220.80	N24°51'10"W
1	160.60	88.26	87.18	N64°12'40"E
2	2298.02	79.43	79.42	N54°10'30"E
2	2298.02	144.28	144.25	N56°57'30"E
2	223.35	52.84	52.72	N55°14'40"E
3	2298.02	144.85	144.85	N60°35'00"E
3	211.68	111.28	110.00	N77°04'50"E
4	481.48	125.82	125.46	N30°47'50"W
4	185.68	264.10	242.40	N77°13'50"W
5	481.48	105.27	105.06	N17°02'50"W
7	2298.02	21.59	21.59	N52°54'40"E
8	120.60	66.28	65.45	N64°12'40"E
10	185.68	85.68	84.93	N23°15'50"W
11	211.68	267.49	265.90	N48°57'10"W
12	185.68	85.68	84.93	N23°15'50"W

EDITED BY JAYMESON ADAMS, EIT
A000919
2019-02-28

JOHN H. KENNEDY LTD.
ONTARIO AND CANADA LANDS SURVEYORS
KEMPTVILLE PORTLAND NEPEAN
REF: 91 - 20 - 316

~~15-19~~ 15-91-1803

D

Appendix D -
JL Richards Release Rate Summary

TABLE 4 : Volume, Depth and Duration of Surface Ponding during a Chicago Storm

			RETURN PERIOD (YEAR)																	
			1:2			1:5			1:10			1:25			1:50			1:100		
BASIN	R.R. (L/s)	#P.L.S.	V.S.P. (m^3)	Max De.S.P. (mm)	Du.S.P. (hrs)	V.S.P. (m^3)	Max De.S.P. (mm)	Du.S.P. (hrs)	V.S.P. (m^3)	Max De.S.P. (mm)	Du.S.P. (hrs)	V.S.P. (m^3)	Max De.S.P. (mm)	Du.S.P. (hrs)	V.S.P. (m^3)	Max De.S.P. (mm)	Du.S.P. (hrs)	V.S.P. (m^3)	Max De.S.P. (mm)	Du.S.P. (hrs)
S5	63	6	170	105	0.75	240	120	1.06	260	120	1.15	350	135	1.54	380	140	1.68	450	145	1.98
S10	63	5	150	105	0.66	210	120	0.93	230	125	1.01	310	135	1.37	340	140	1.50	400	145	1.76
S14	42	NA*	160	NA*	1.06	210	NA*	1.39	240	NA*	1.59	310	NA*	2.05	340	NA*	2.25	390	NA*	2.58
S16	42	NA*	150	NA*	0.99	200	NA*	1.32	220	NA*	1.46	290	NA*	1.92	320	NA*	2.12	370	NA*	2.45
S18	84	11	380	110	1.26	520	125	1.72	570	125	1.88	740	140	2.45	810	140	2.68	940	150	3.11
S21	42	3	80	100	0.53	110	115	0.73	120	120	0.79	160	130	1.06	180	135	1.19	210	140	1.39
S23	21	1	70	140	0.93	90	160	1.19	100	160	1.32	130	180	1.72	140	180	1.85	170	195	2.25
S24	21	3	110	115	1.46	140	125	1.85	160	130	2.12	200	140	2.65	220	140	2.91	250	145	3.31
S26	42	6	210	115	1.39	290	125	1.92	320	130	2.12	410	140	2.71	450	145	2.98	520	150	3.44
N2	42	6	150	100	0.99	200	110	1.32	220	115	1.46	290	125	1.92	320	130	2.12	370	135	2.45
N5	42	4	120	105	0.79	170	120	1.12	190	125	1.26	250	135	1.65	270	140	1.79	320	145	2.12
N7	63	4	130	110	0.57	190	125	0.84	210	130	0.93	280	140	1.23	310	145	1.37	360	150	1.59
N11	84	NA*	230	NA*	0.76	320	NA*	1.06	360	NA*	1.19	480	NA*	1.59	530	NA*	1.75	610	NA*	2.02
N13	84	NA*	200	NA*	0.66	270	NA*	0.89	310	NA*	1.03	400	NA*	1.32	450	NA*	1.49	520	NA*	1.72
N17	42	4	130	110	0.86	180	125	1.19	200	125	1.32	260	140	1.72	290	140	1.92	340	150	2.25
N18	63	4	130	110	0.57	180	125	0.79	210	130	0.93	270	140	1.19	300	145	1.32	360	150	1.59
N21	84	14	570	120	1.88	760	130	2.51	830	135	2.74	1070	145	3.54	1170	150	3.87	1350	155	4.46
N23	42	4	140	110	0.93	200	125	1.32	220	130	1.46	290	145	1.92	310	145	2.05	360	150	2.38
N22	62	5	280	130	1.25	390	145	1.75	420	150	1.88	550	165	2.46	600	170	2.69	700	180	3.14

NOTE:
R.R.= Release Rate in L/s
V.S.P.= Volume of Surface Ponding in m^3
Maximum De.S.P.= Maximum Depth of Surface Ponding in mm
Du.S.P.= Duration of Surface Ponding in hours
#P.L.S.= Number of Parking Lot Sags for Surface Ponding Storage

* NA: Not applicable as on-site stormwater management will be implemented using various techniques such as roof top storage, parking lot storage, underground/ above ground storage etc.

E

Appendix E -
Storm Water Management and Storm Sewer Design Calculations

EVALUATION OF RUNOFF COEFFICIENTS

Client: Cominar
Project: 800 Palladium Dr.
Location: Ottawa, On.
Project #: A000919

Area	Grassed Area (m²)	Runoff Coefficient	Hard Surface Area (m²)	Runoff Coefficient	Total Area (m²)	Runoff Coefficient (10-year event)	Runoff Coefficient (100-year)
BUILDING	0	0.20	2768	0.90	2768	0.90	0.95
A	225	0.20	1597	0.90	1822	0.81	0.95
B	218	0.20	1504	0.90	1722	0.81	0.95
C	74	0.20	1297	0.90	1371	0.86	0.95
D	18	0.20	1135	0.90	1153	0.89	0.95
E	219	0.20	1250	0.90	1469	0.80	0.95
F	198	0.20	1159	0.90	1357	0.80	0.95
G	236	0.20	90	0.90	326	0.39	0.49
H	0	0.20	59	0.90	59	0.90	0.95
I	116	0.20	0	0.90	116	0.20	0.25
J	23	0.20	59	0.90	82	0.70	0.88
K	0	0.20	24	0.90	24	0.90	0.95
L	22	0.20	64	0.90	86	0.72	0.90
M	151	0.20	0	0.90	151	0.20	0.25
TOTAL	1500	0.20	11006	0.90	12506	0.82	0.95

Prepared by: Benjamin Tardioli, EIT Date: 2019-06-11

Verified by: Tim Kennedy, P.Eng. Date: 2019-06-11

STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 37.62 L/s/ha

Area **:** A 0.1822 ha
Runoff Coefficient C : 0.81
Rainfall Event : 5 yr
Discharge Flow Q : 0.006854364 m³/s
Discharge Factor K : 1

Design Volume: **27.46 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.810	0.810	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.820	0.820	0.820	0.820

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

Init._____

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	17.36	2.0563092	15.31
10.0	104.19	25.63	4.1126184	21.52
15.0	83.56	30.83	6.1689276	24.66
20.0	70.25	34.56	8.2252368	26.33
25.0	60.90	37.45	10.281546	27.16
30.0	53.93	39.79	12.3378552	27.46
35.0	48.52	41.77	14.3941644	27.37
40.0	44.18	43.47	16.4504736	27.02
45.0	40.63	44.97	18.5067828	26.46
50.0	37.65	46.31	20.563092	25.74
55.0	35.12	47.52	22.6194012	24.90
60.0	32.94	48.62	24.6757104	23.94
65.0	31.04	49.63	26.7320196	22.90
70.0	29.37	50.57	28.7883288	21.78
75.0	27.89	51.45	30.844638	20.60
80.0	26.56	52.27	32.9009472	19.37
85.0	25.37	53.04	34.9572564	18.08
90.0	24.29	53.77	37.0135656	16.75
95.0	23.31	54.46	39.0698748	15.39
100.0	22.41	55.11	41.126184	13.99
105.0	21.58	55.74	43.1824932	12.56
110.0	20.82	56.34	45.2388024	11.10
115.0	20.12	56.91	47.2951116	9.62
120.0	19.47	57.46	49.3514208	8.11
125.0	18.86	57.99	51.40773	6.58
130.0	18.29	58.50	53.4640392	5.03
135.0	17.76	58.99	55.5203484	3.47
140.0	17.27	59.46	57.5766576	1.89
145.0	16.80	59.92	59.6329668	0.29
150.0	16.36	60.37	61.689276	-1.32
155.0	15.95	60.80	63.7455852	-2.95
160.0	15.56	61.22	65.8018944	-4.58
165.0	15.18	61.63	67.8582036	-6.23
170.0	14.83	62.02	69.9145128	-7.89
175.0	14.50	62.41	71.970822	-9.56
180.0	14.18	62.78	74.0271312	-11.25
185.0	13.88	63.15	76.0834404	-12.94
190.0	13.59	63.50	78.1397496	-14.64
195.0	13.31	63.85	80.1960588	-16.34
200.0	13.05	64.19	82.252368	-18.06
205.0	12.80	64.53	84.3086772	-19.78
210.0	12.56	64.85	86.3649864	-21.51
215.0	12.32	65.17	88.4212956	-23.25
220.0	12.10	65.48	90.4776048	-24.99

Init._____

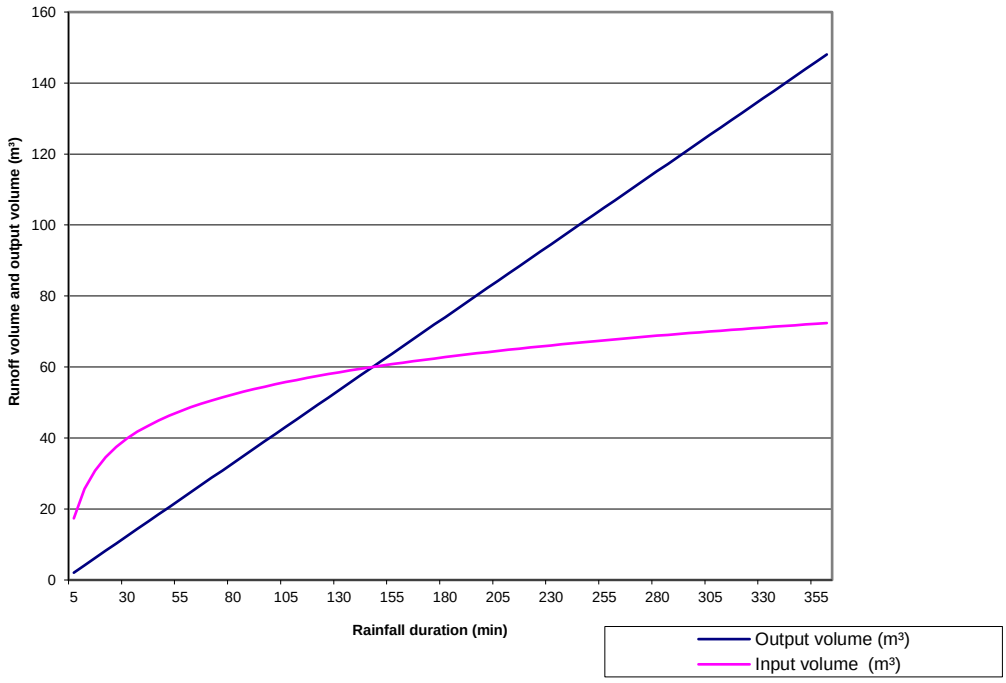
225.0	11.89	65.79	92.533914	-26.74
230.0	11.68	66.09	94.5902232	-28.50
235.0	11.48	66.39	96.6465324	-30.26
240.0	11.29	66.67	98.7028416	-32.03
245.0	11.11	66.96	100.759151	-33.80
250.0	10.93	67.24	102.81546	-35.58
255.0	10.76	67.51	104.871769	-37.36
260.0	10.60	67.78	106.928078	-39.15
265.0	10.44	68.04	108.984388	-40.94
270.0	10.28	68.30	111.040697	-42.74
275.0	10.14	68.56	113.097006	-44.54
280.0	9.99	68.81	115.153315	-46.34
285.0	9.85	69.06	117.209624	-48.15
290.0	9.72	69.30	119.265934	-49.96
295.0	9.58	69.54	121.322243	-51.78
300.0	9.46	69.78	123.378552	-53.60
305.0	9.33	70.01	125.434861	-55.42
310.0	9.21	70.24	127.49117	-57.25
315.0	9.10	70.47	129.54748	-59.08
320.0	8.98	70.69	131.603789	-60.91
325.0	8.87	70.91	133.660098	-62.75
330.0	8.76	71.13	135.716407	-64.58
335.0	8.66	71.35	137.772716	-66.43
340.0	8.56	71.56	139.829026	-68.27
345.0	8.46	71.77	141.885335	-70.12
350.0	8.36	71.97	143.941644	-71.97
355.0	8.27	72.18	145.997953	-73.82
360.0	8.17	72.38	148.054262	-75.67
Max Volume (V max):				27.46
Design Volume (V design) :				**27.46**

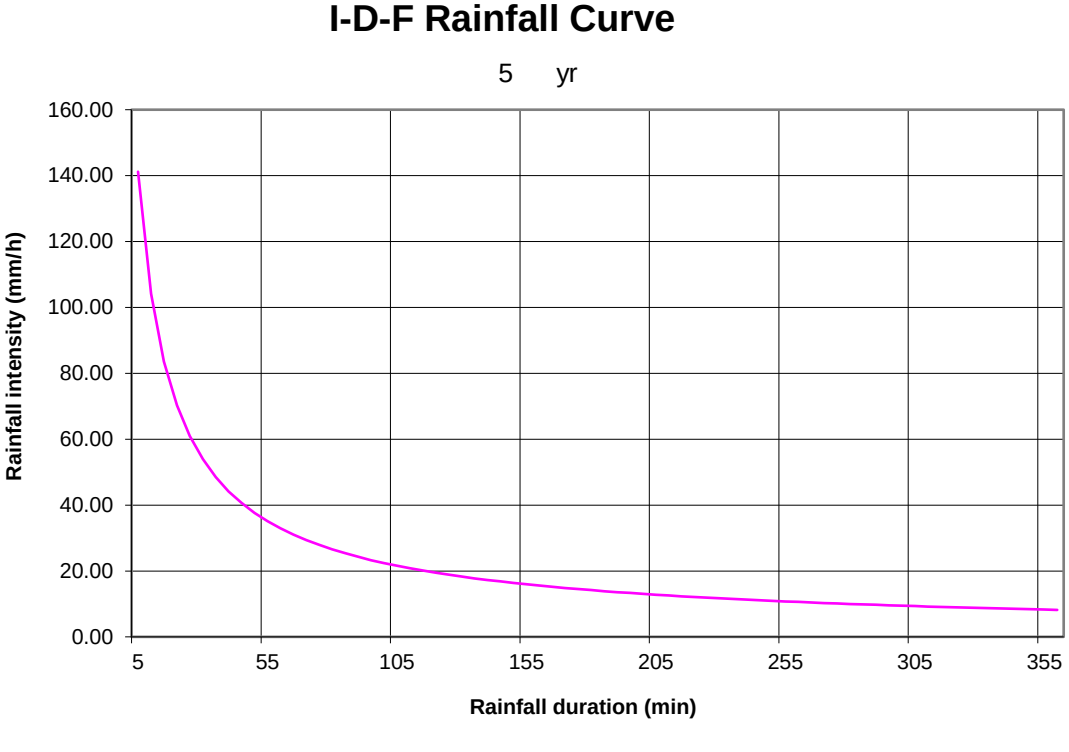
Init._____

800 Palladium Dr.
Office Building

Sub-Area A

Storm water pond sizing using the rational method





Init._____

STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 37.62 L/s/ha

Area **:** B 0.1722 ha
Runoff Coefficient C : 0.81
Rainfall Event : 5 yr
Discharge Flow Q : 0.006478164 m³/s
Discharge Factor K : 1

Design Volume: **25.95 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

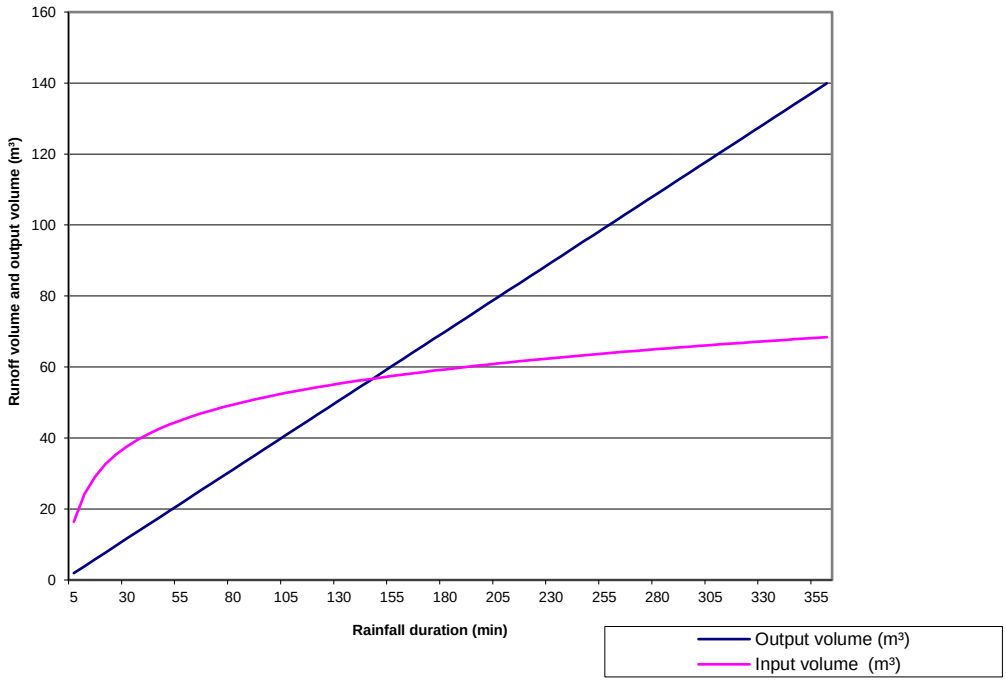
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	16.41	1.9434492	14.47
10.0	104.19	24.22	3.8868984	20.33
15.0	83.56	29.14	5.8303476	23.31
20.0	70.25	32.66	7.7737968	24.89
25.0	60.90	35.39	9.717246	25.67
30.0	53.93	37.61	11.6606952	25.95
35.0	48.52	39.48	13.6041444	25.87
40.0	44.18	41.09	15.5475936	25.54
45.0	40.63	42.50	17.4910428	25.01
50.0	37.65	43.77	19.434492	24.33
55.0	35.12	44.91	21.3779412	23.53
60.0	32.94	45.95	23.3213904	22.63
65.0	31.04	46.91	25.2648396	21.64
70.0	29.37	47.80	27.2082888	20.59
75.0	27.89	48.62	29.151738	19.47
80.0	26.56	49.40	31.0951872	18.30
85.0	25.37	50.13	33.0386364	17.09
90.0	24.29	50.82	34.9820856	15.83
95.0	23.31	51.47	36.9255348	14.54
100.0	22.41	52.09	38.868984	13.22
105.0	21.58	52.68	40.8124332	11.87
110.0	20.82	53.25	42.7558824	10.49
115.0	20.12	53.79	44.6993316	9.09
120.0	19.47	54.31	46.6427808	7.66
125.0	18.86	54.81	48.58623	6.22
130.0	18.29	55.29	50.5296792	4.76
135.0	17.76	55.75	52.4731284	3.28
140.0	17.27	56.20	54.4165776	1.78
145.0	16.80	56.64	56.3600268	0.27
150.0	16.36	57.06	58.303476	-1.25
155.0	15.95	57.46	60.2469252	-2.78
160.0	15.56	57.86	62.1903744	-4.33
165.0	15.18	58.24	64.1338236	-5.89
170.0	14.83	58.62	66.0772728	-7.46
175.0	14.50	58.98	68.020722	-9.04
180.0	14.18	59.34	69.9641712	-10.63
185.0	13.88	59.68	71.9076204	-12.23
190.0	13.59	60.02	73.8510696	-13.83
195.0	13.31	60.35	75.7945188	-15.45
200.0	13.05	60.67	77.737968	-17.07
205.0	12.80	60.99	79.6814172	-18.70
210.0	12.56	61.29	81.6248664	-20.33
215.0	12.32	61.60	83.5683156	-21.97
220.0	12.10	61.89	85.5117648	-23.62

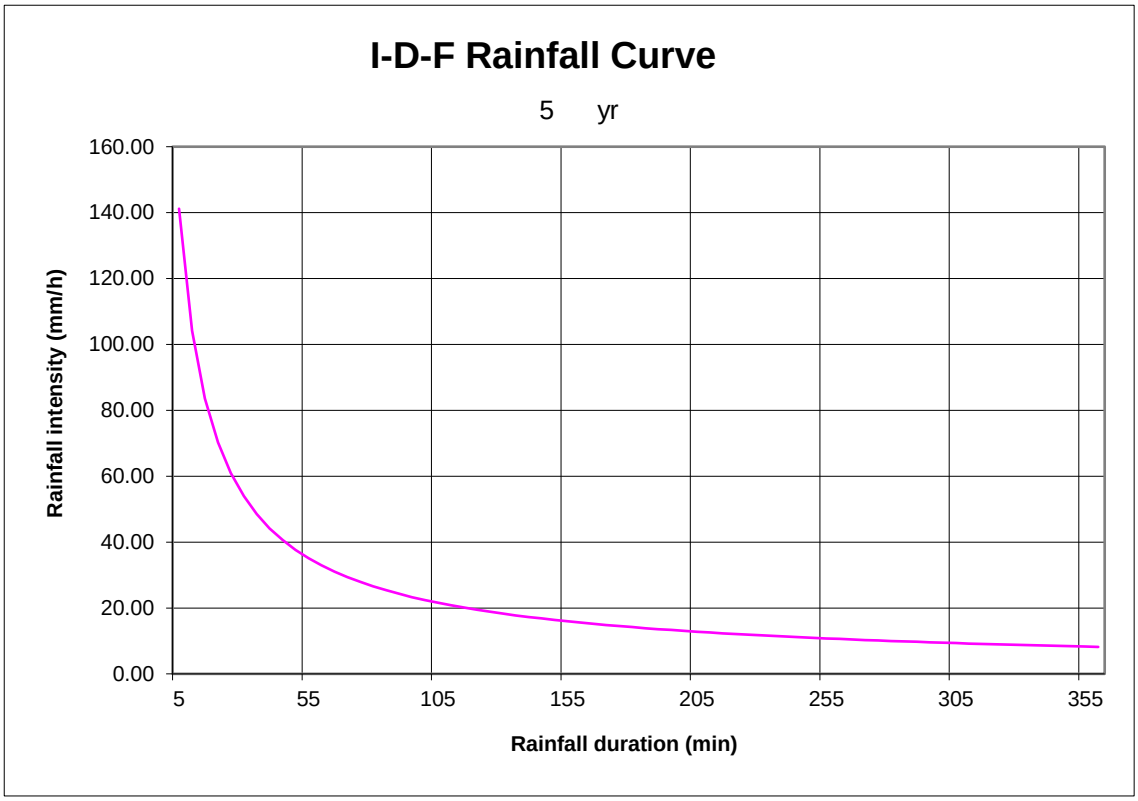
225.0	11.89	62.18	87.455214	-25.28
230.0	11.68	62.46	89.3986632	-26.94
235.0	11.48	62.74	91.3421124	-28.60
240.0	11.29	63.01	93.2855616	-30.27
245.0	11.11	63.28	95.2290108	-31.95
250.0	10.93	63.55	97.17246	-33.63
255.0	10.76	63.80	99.1159092	-35.31
260.0	10.60	64.06	101.059358	-37.00
265.0	10.44	64.31	103.002808	-38.69
270.0	10.28	64.55	104.946257	-40.39
275.0	10.14	64.80	106.889706	-42.09
280.0	9.99	65.03	108.833155	-43.80
285.0	9.85	65.27	110.776604	-45.51
290.0	9.72	65.50	112.720054	-47.22
295.0	9.58	65.73	114.663503	-48.94
300.0	9.46	65.95	116.606952	-50.66
305.0	9.33	66.17	118.550401	-52.38
310.0	9.21	66.39	120.49385	-54.11
315.0	9.10	66.60	122.4373	-55.84
320.0	8.98	66.81	124.380749	-57.57
325.0	8.87	67.02	126.324198	-59.30
330.0	8.76	67.23	128.267647	-61.04
335.0	8.66	67.43	130.211096	-62.78
340.0	8.56	67.63	132.154546	-64.52
345.0	8.46	67.83	134.097995	-66.27
350.0	8.36	68.02	136.041444	-68.02
355.0	8.27	68.22	137.984893	-69.77
360.0	8.17	68.41	139.928342	-71.52
Max Volume (V max):				25.95
Design Volume (V design) :				**25.95**

800 Palladium Dr.
Office Building

Sub-area B

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 38 L/s/ha

Area **:** C 0.1371 ha
Runoff Coefficient C : 0.86
Rainfall Event : 5 yr
Discharge Flow Q : 0.0052098 m³/s
Discharge Factor K : 1

Design Volume: **22.43 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

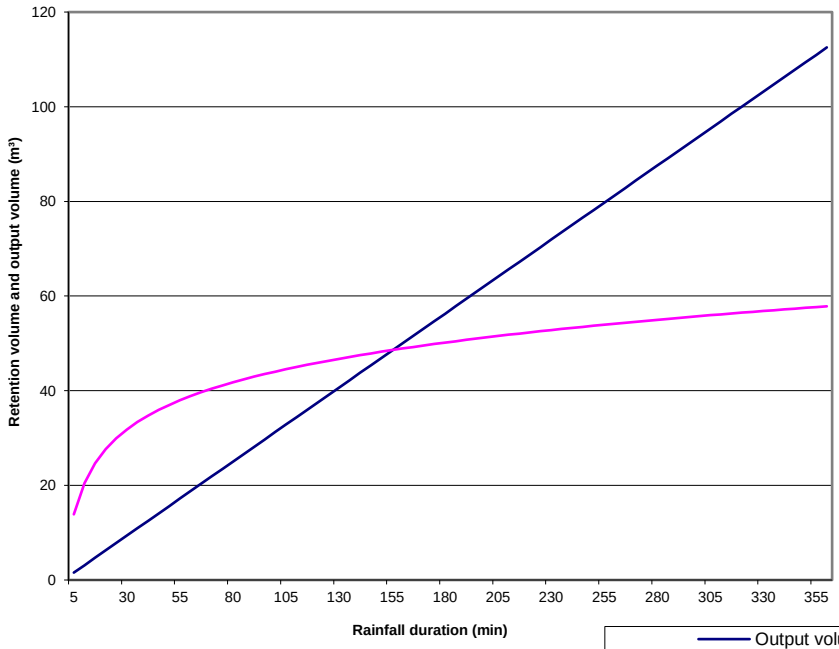
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	13.87	1.56294	12.31
10.0	104.19	20.47	3.12588	17.35
15.0	83.56	24.63	4.68882	19.94
20.0	70.25	27.61	6.25176	21.36
25.0	60.90	29.92	7.8147	22.10
30.0	53.93	31.79	9.37764	22.41
35.0	48.52	33.37	10.94058	22.43
40.0	44.18	34.73	12.50352	22.23
45.0	40.63	35.93	14.06646	21.86
50.0	37.65	37.00	15.6294	21.37
55.0	35.12	37.96	17.19234	20.77
60.0	32.94	38.84	18.75528	20.09
65.0	31.04	39.65	20.31822	19.33
70.0	29.37	40.40	21.88116	18.52
75.0	27.89	41.10	23.4441	17.66
80.0	26.56	41.76	25.00704	16.75
85.0	25.37	42.37	26.56998	15.80
90.0	24.29	42.96	28.13292	14.82
95.0	23.31	43.51	29.69586	13.81
100.0	22.41	44.03	31.2588	12.77
105.0	21.58	44.53	32.82174	11.71
110.0	20.82	45.01	34.38468	10.63
115.0	20.12	45.47	35.94762	9.52
120.0	19.47	45.91	37.51056	8.40
125.0	18.86	46.33	39.0735	7.26
130.0	18.29	46.74	40.63644	6.10
135.0	17.76	47.13	42.19938	4.93
140.0	17.27	47.51	43.76232	3.75
145.0	16.80	47.87	45.32526	2.55
150.0	16.36	48.23	46.8882	1.34
155.0	15.95	48.57	48.45114	0.12
160.0	15.56	48.91	50.01408	-1.11
165.0	15.18	49.23	51.57702	-2.34
170.0	14.83	49.55	53.13996	-3.59
175.0	14.50	49.86	54.7029	-4.85
180.0	14.18	50.16	56.26584	-6.11
185.0	13.88	50.45	57.82878	-7.38
190.0	13.59	50.74	59.39172	-8.66
195.0	13.31	51.01	60.95466	-9.94
200.0	13.05	51.29	62.5176	-11.23
205.0	12.80	51.55	64.08054	-12.53
210.0	12.56	51.81	65.64348	-13.83
215.0	12.32	52.07	67.20642	-15.14
220.0	12.10	52.32	68.76936	-16.45

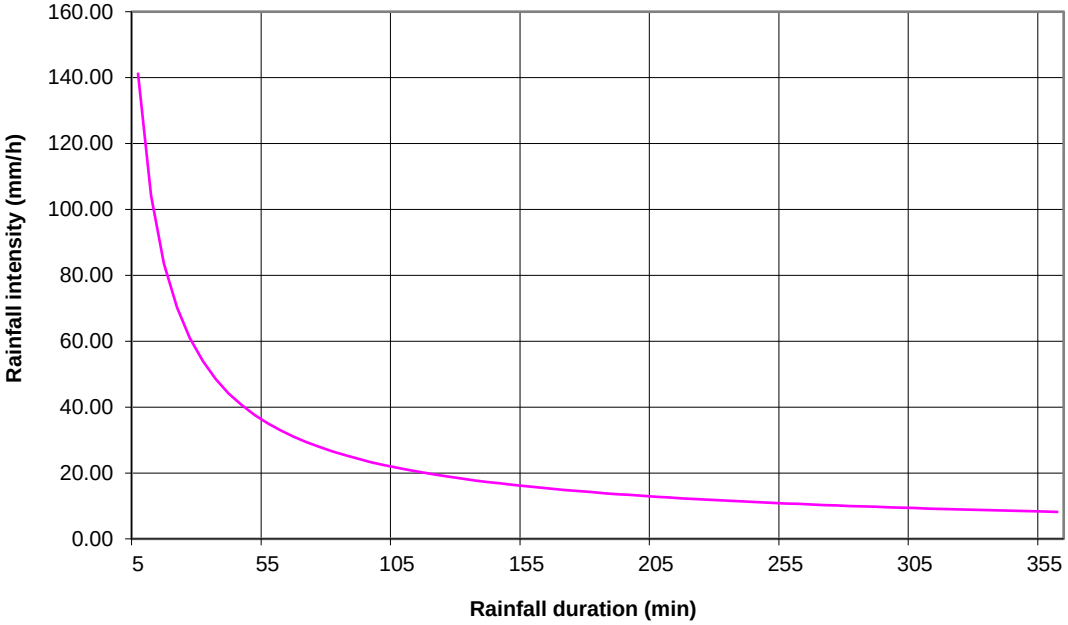
225.0	11.89	52.56	70.3323	-17.77
230.0	11.68	52.80	71.89524	-19.09
235.0	11.48	53.04	73.45818	-20.42
240.0	11.29	53.27	75.02112	-21.75
245.0	11.11	53.49	76.58406	-23.09
250.0	10.93	53.72	78.147	-24.43
255.0	10.76	53.93	79.70994	-25.78
260.0	10.60	54.15	81.27288	-27.12
265.0	10.44	54.36	82.83582	-28.48
270.0	10.28	54.57	84.39876	-29.83
275.0	10.14	54.77	85.9617	-31.19
280.0	9.99	54.97	87.52464	-32.55
285.0	9.85	55.17	89.08758	-33.92
290.0	9.72	55.37	90.65052	-35.28
295.0	9.58	55.56	92.21346	-36.65
300.0	9.46	55.75	93.7764	-38.03
305.0	9.33	55.93	95.33934	-39.40
310.0	9.21	56.12	96.90228	-40.78
315.0	9.10	56.30	98.46522	-42.17
320.0	8.98	56.48	100.02816	-43.55
325.0	8.87	56.65	101.5911	-44.94
330.0	8.76	56.83	103.15404	-46.33
335.0	8.66	57.00	104.71698	-47.72
340.0	8.56	57.17	106.27992	-49.11
345.0	8.46	57.34	107.84286	-50.51
350.0	8.36	57.50	109.4058	-51.90
355.0	8.27	57.66	110.96874	-53.30
360.0	8.17	57.83	112.53168	-54.71
Max Volume (V max):				22.43
Design Volume (V design) :				**22.43**

800 Palladium Dr.
Office Building

Sub-area C

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 38 L/s/ha

Area **:** D 0.1153 ha
Runoff Coefficient C : 0.89
Rainfall Event : 5 yr
Discharge Flow Q : 0.0043814 m³/s
Discharge Factor K : 1

Design Volume: **19.84 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

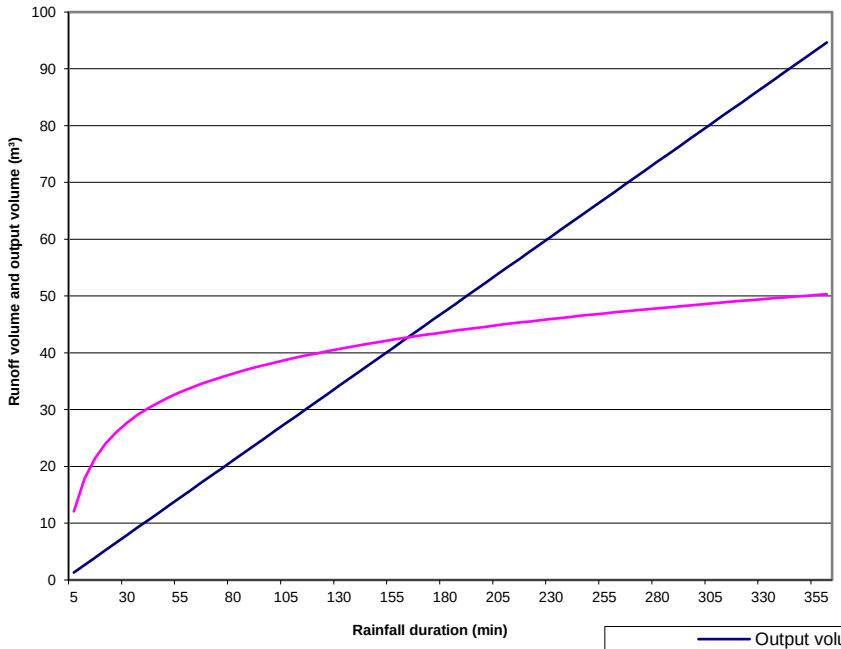
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	12.07	1.31442	10.76
10.0	104.19	17.82	2.62884	15.19
15.0	83.56	21.44	3.94326	17.49
20.0	70.25	24.03	5.25768	18.77
25.0	60.90	26.04	6.5721	19.47
30.0	53.93	27.67	7.88652	19.78
35.0	48.52	29.04	9.20094	19.84
40.0	44.18	30.23	10.51536	19.71
45.0	40.63	31.27	11.82978	19.44
50.0	37.65	32.20	13.1442	19.05
55.0	35.12	33.04	14.45862	18.58
60.0	32.94	33.81	15.77304	18.03
65.0	31.04	34.51	17.08746	17.42
70.0	29.37	35.16	18.40188	16.76
75.0	27.89	35.77	19.7163	16.06
80.0	26.56	36.34	21.03072	15.31
85.0	25.37	36.88	22.34514	14.53
90.0	24.29	37.39	23.65956	13.73
95.0	23.31	37.87	24.97398	12.89
100.0	22.41	38.32	26.2884	12.03
105.0	21.58	38.76	27.60282	11.15
110.0	20.82	39.17	28.91724	10.26
115.0	20.12	39.57	30.23166	9.34
120.0	19.47	39.95	31.54608	8.41
125.0	18.86	40.32	32.8605	7.46
130.0	18.29	40.68	34.17492	6.50
135.0	17.76	41.02	35.48934	5.53
140.0	17.27	41.35	36.80376	4.54
145.0	16.80	41.67	38.11818	3.55
150.0	16.36	41.98	39.4326	2.54
155.0	15.95	42.28	40.74702	1.53
160.0	15.56	42.57	42.06144	0.51
165.0	15.18	42.85	43.37586	-0.53
170.0	14.83	43.12	44.69028	-1.57
175.0	14.50	43.39	46.0047	-2.61
180.0	14.18	43.65	47.31912	-3.67
185.0	13.88	43.91	48.63354	-4.73
190.0	13.59	44.16	49.94796	-5.79
195.0	13.31	44.40	51.26238	-6.86
200.0	13.05	44.64	52.5768	-7.94
205.0	12.80	44.87	53.89122	-9.02
210.0	12.56	45.09	55.20564	-10.11
215.0	12.32	45.32	56.52006	-11.20
220.0	12.10	45.53	57.83448	-12.30

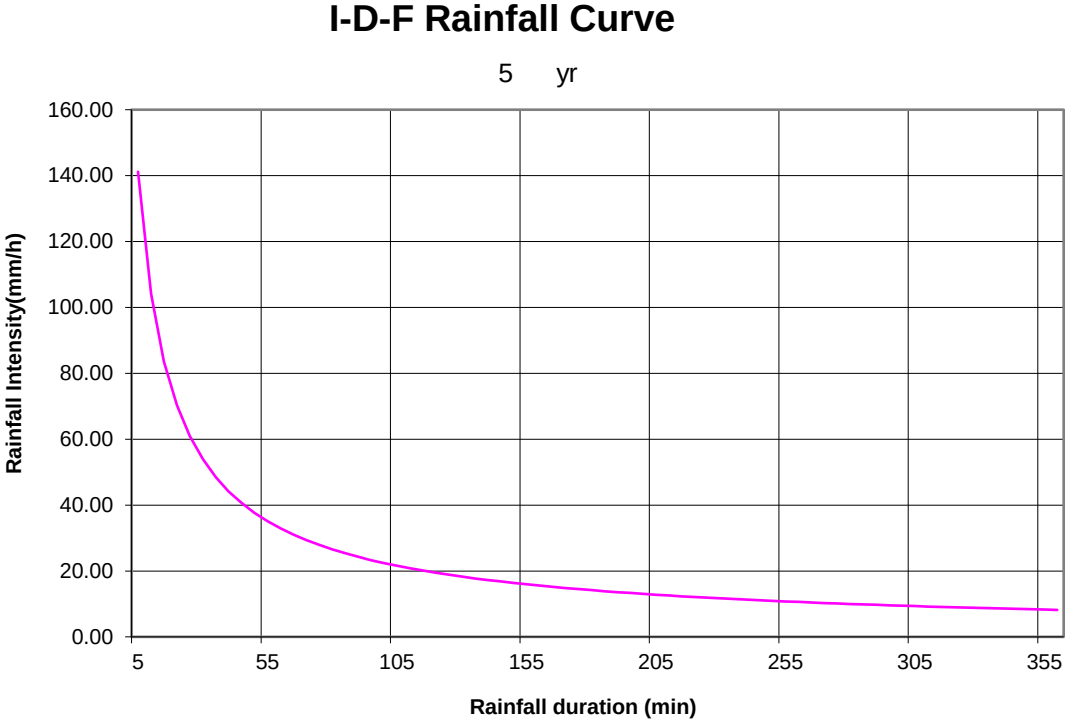
225.0	11.89	45.75	59.1489	-13.40
230.0	11.68	45.95	60.46332	-14.51
235.0	11.48	46.16	61.77774	-15.62
240.0	11.29	46.36	63.09216	-16.73
245.0	11.11	46.56	64.40658	-17.85
250.0	10.93	46.75	65.721	-18.97
255.0	10.76	46.94	67.03542	-20.09
260.0	10.60	47.13	68.34984	-21.22
265.0	10.44	47.31	69.66426	-22.35
270.0	10.28	47.49	70.97868	-23.49
275.0	10.14	47.67	72.2931	-24.62
280.0	9.99	47.85	73.60752	-25.76
285.0	9.85	48.02	74.92194	-26.90
290.0	9.72	48.19	76.23636	-28.05
295.0	9.58	48.35	77.55078	-29.20
300.0	9.46	48.52	78.8652	-30.35
305.0	9.33	48.68	80.17962	-31.50
310.0	9.21	48.84	81.49404	-32.65
315.0	9.10	49.00	82.80846	-33.81
320.0	8.98	49.15	84.12288	-34.97
325.0	8.87	49.31	85.4373	-36.13
330.0	8.76	49.46	86.75172	-37.29
335.0	8.66	49.61	88.06614	-38.46
340.0	8.56	49.76	89.38056	-39.62
345.0	8.46	49.90	90.69498	-40.79
350.0	8.36	50.05	92.0094	-41.96
355.0	8.27	50.19	93.32382	-43.14
360.0	8.17	50.33	94.63824	-44.31
Max Volume (V max):				19.84
Design Volume (V design) :				**19.84**

800 Palladium Dr.
Office Building

Sub-area D

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 38 L/s/ha

Area **:** E 0.1469 ha
Runoff Coefficient C : 0.8
Rainfall Event : 5 yr
Discharge Flow Q : 0.0055822 m³/s
Discharge Factor K : 1

Design Volume: **21.64 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

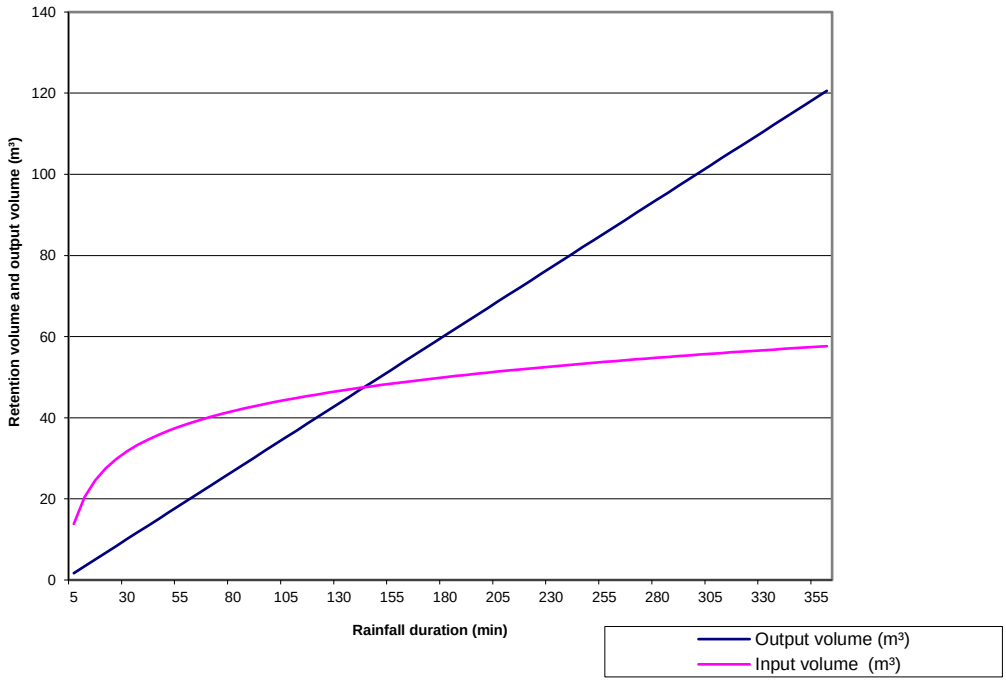
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	13.83	1.67466	12.15
10.0	104.19	20.41	3.34932	17.06
15.0	83.56	24.55	5.02398	19.53
20.0	70.25	27.52	6.69864	20.82
25.0	60.90	29.82	8.3733	21.45
30.0	53.93	31.69	10.04796	21.64
35.0	48.52	33.26	11.72262	21.54
40.0	44.18	34.62	13.39728	21.22
45.0	40.63	35.81	15.07194	20.74
50.0	37.65	36.88	16.7466	20.13
55.0	35.12	37.84	18.42126	19.42
60.0	32.94	38.72	20.09592	18.62
65.0	31.04	39.52	21.77058	17.75
70.0	29.37	40.27	23.44524	16.83
75.0	27.89	40.97	25.1199	15.85
80.0	26.56	41.62	26.79456	14.83
85.0	25.37	42.24	28.46922	13.77
90.0	24.29	42.82	30.14388	12.67
95.0	23.31	43.37	31.81854	11.55
100.0	22.41	43.89	33.4932	10.39
105.0	21.58	44.39	35.16786	9.22
110.0	20.82	44.86	36.84252	8.02
115.0	20.12	45.32	38.51718	6.80
120.0	19.47	45.76	40.19184	5.56
125.0	18.86	46.18	41.8665	4.31
130.0	18.29	46.58	43.54116	3.04
135.0	17.76	46.97	45.21582	1.76
140.0	17.27	47.35	46.89048	0.46
145.0	16.80	47.72	48.56514	-0.85
150.0	16.36	48.07	50.2398	-2.17
155.0	15.95	48.42	51.91446	-3.50
160.0	15.56	48.75	53.58912	-4.84
165.0	15.18	49.07	55.26378	-6.19
170.0	14.83	49.39	56.93844	-7.55
175.0	14.50	49.69	58.6131	-8.92
180.0	14.18	49.99	60.28776	-10.29
185.0	13.88	50.28	61.96242	-11.68
190.0	13.59	50.57	63.63708	-13.07
195.0	13.31	50.85	65.31174	-14.47
200.0	13.05	51.12	66.9864	-15.87
205.0	12.80	51.38	68.66106	-17.28
210.0	12.56	51.64	70.33572	-18.69
215.0	12.32	51.90	72.01038	-20.11
220.0	12.10	52.15	73.68504	-21.54

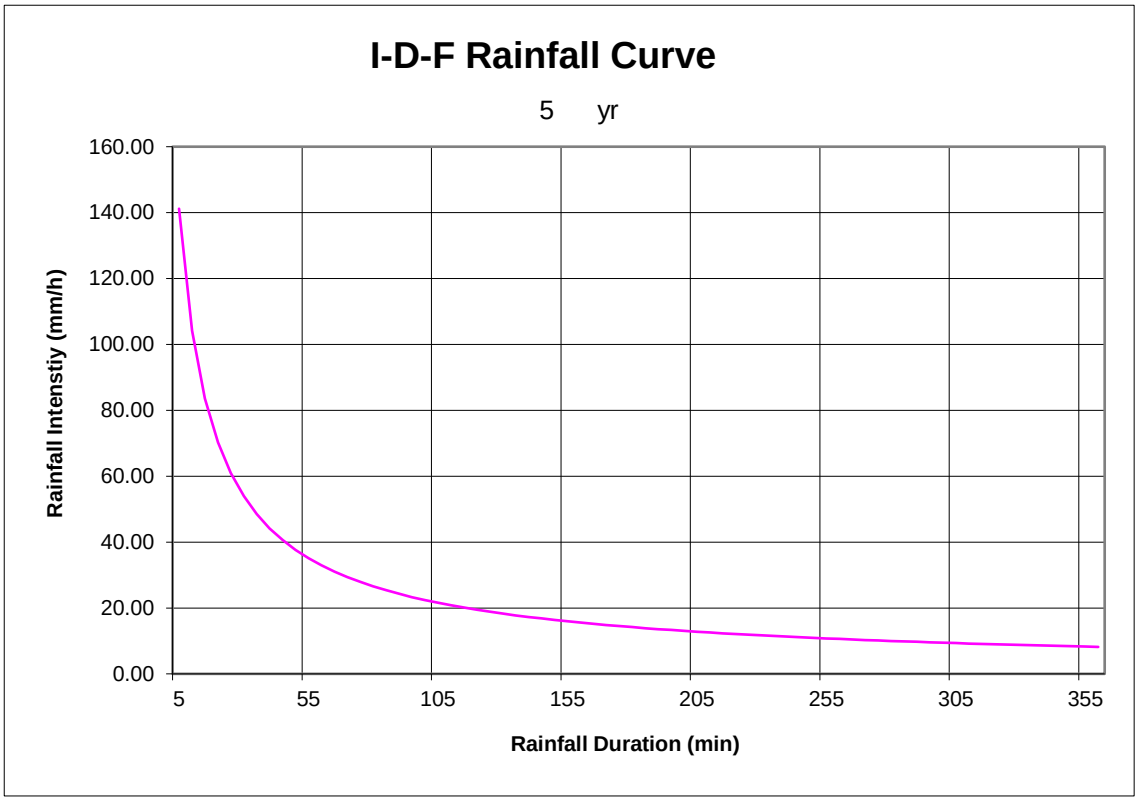
225.0	11.89	52.39	75.3597	-22.97
230.0	11.68	52.63	77.03436	-24.41
235.0	11.48	52.86	78.70902	-25.85
240.0	11.29	53.09	80.38368	-27.29
245.0	11.11	53.32	82.05834	-28.74
250.0	10.93	53.54	83.733	-30.19
255.0	10.76	53.76	85.40766	-31.65
260.0	10.60	53.97	87.08232	-33.11
265.0	10.44	54.18	88.75698	-34.57
270.0	10.28	54.39	90.43164	-36.04
275.0	10.14	54.59	92.1063	-37.51
280.0	9.99	54.79	93.78096	-38.99
285.0	9.85	54.99	95.45562	-40.46
290.0	9.72	55.19	97.13028	-41.94
295.0	9.58	55.38	98.80494	-43.43
300.0	9.46	55.57	100.4796	-44.91
305.0	9.33	55.75	102.15426	-46.40
310.0	9.21	55.93	103.82892	-47.89
315.0	9.10	56.12	105.50358	-49.39
320.0	8.98	56.29	107.17824	-50.89
325.0	8.87	56.47	108.8529	-52.38
330.0	8.76	56.64	110.52756	-53.89
335.0	8.66	56.81	112.20222	-55.39
340.0	8.56	56.98	113.87688	-56.89
345.0	8.46	57.15	115.55154	-58.40
350.0	8.36	57.31	117.2262	-59.91
355.0	8.27	57.48	118.90086	-61.42
360.0	8.17	57.64	120.57552	-62.94
Max Volume (V max):				21.64
Design Volume (V design) :				**21.64**

800 Palladium Dr.
Office Building

Sub-area E

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 38 L/s/ha

Area **:** F 0.1357 ha
Runoff Coefficient C : 0.8
Rainfall Event : 5 yr
Discharge Flow Q : 0.0051566 m³/s
Discharge Factor K : 1

Design Volume: **19.99 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

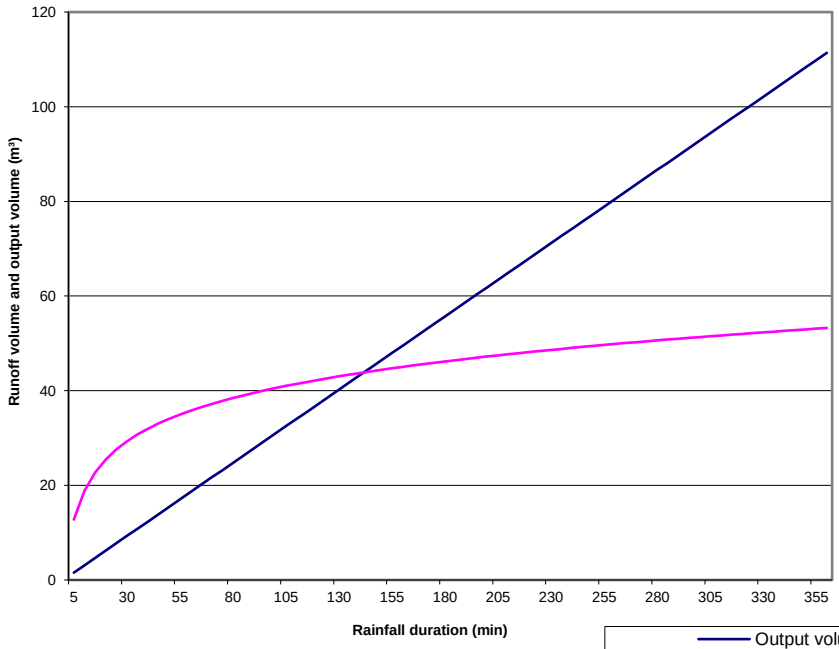
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	12.77	1.54698	11.22
10.0	104.19	18.85	3.09396	15.76
15.0	83.56	22.68	4.64094	18.04
20.0	70.25	25.42	6.18792	19.23
25.0	60.90	27.55	7.7349	19.81
30.0	53.93	29.27	9.28188	19.99
35.0	48.52	30.72	10.82886	19.90
40.0	44.18	31.98	12.37584	19.60
45.0	40.63	33.08	13.92282	19.16
50.0	37.65	34.06	15.4698	18.59
55.0	35.12	34.95	17.01678	17.94
60.0	32.94	35.76	18.56376	17.20
65.0	31.04	36.51	20.11074	16.40
70.0	29.37	37.20	21.65772	15.54
75.0	27.89	37.84	23.2047	14.64
80.0	26.56	38.45	24.75168	13.70
85.0	25.37	39.02	26.29866	12.72
90.0	24.29	39.55	27.84564	11.71
95.0	23.31	40.06	29.39262	10.67
100.0	22.41	40.54	30.9396	9.60
105.0	21.58	41.00	32.48658	8.52
110.0	20.82	41.44	34.03356	7.41
115.0	20.12	41.86	35.58054	6.28
120.0	19.47	42.27	37.12752	5.14
125.0	18.86	42.66	38.6745	3.98
130.0	18.29	43.03	40.22148	2.81
135.0	17.76	43.39	41.76846	1.62
140.0	17.27	43.74	43.31544	0.43
145.0	16.80	44.08	44.86242	-0.78
150.0	16.36	44.41	46.4094	-2.00
155.0	15.95	44.72	47.95638	-3.23
160.0	15.56	45.03	49.50336	-4.47
165.0	15.18	45.33	51.05034	-5.72
170.0	14.83	45.62	52.59732	-6.98
175.0	14.50	45.91	54.1443	-8.24
180.0	14.18	46.18	55.69128	-9.51
185.0	13.88	46.45	57.23826	-10.79
190.0	13.59	46.71	58.78524	-12.07
195.0	13.31	46.97	60.33222	-13.36
200.0	13.05	47.22	61.8792	-14.66
205.0	12.80	47.47	63.42618	-15.96
210.0	12.56	47.71	64.97316	-17.27
215.0	12.32	47.94	66.52014	-18.58
220.0	12.10	48.17	68.06712	-19.90

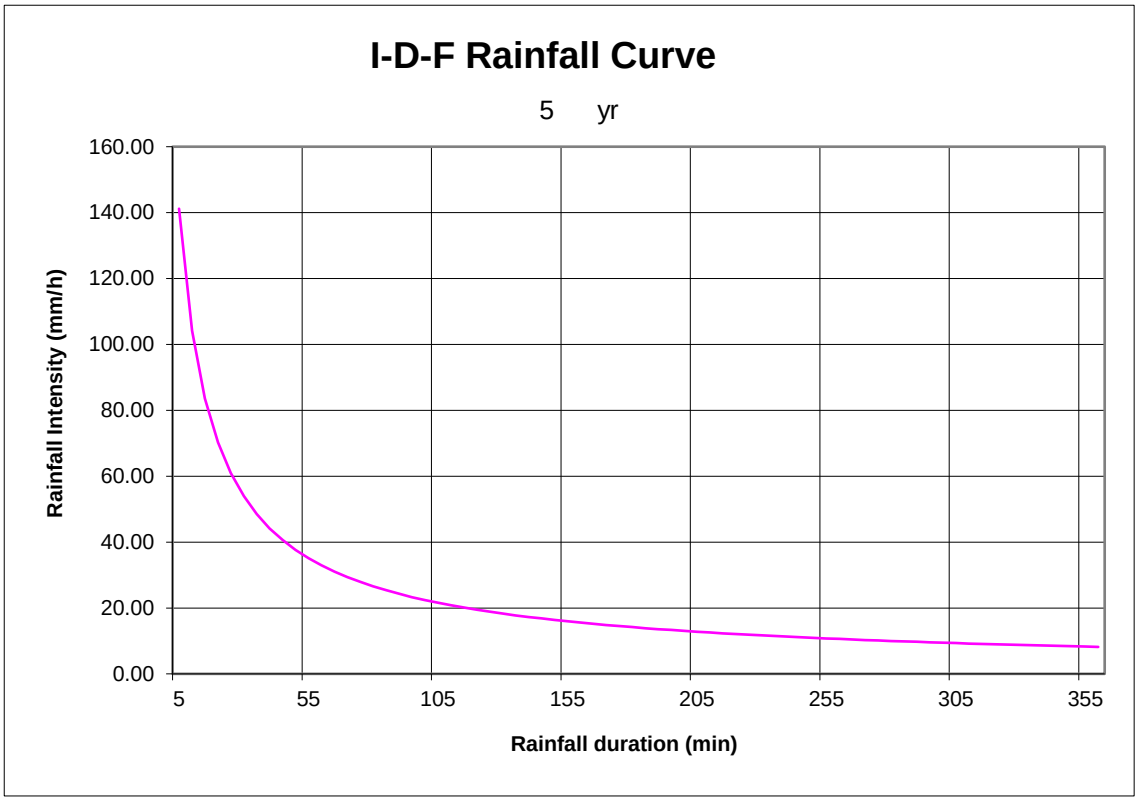
225.0	11.89	48.40	69.6141	-21.22
230.0	11.68	48.62	71.16108	-22.55
235.0	11.48	48.83	72.70806	-23.88
240.0	11.29	49.04	74.25504	-25.21
245.0	11.11	49.25	75.80202	-26.55
250.0	10.93	49.46	77.349	-27.89
255.0	10.76	49.66	78.89598	-29.24
260.0	10.60	49.86	80.44296	-30.59
265.0	10.44	50.05	81.98994	-31.94
270.0	10.28	50.24	83.53692	-33.29
275.0	10.14	50.43	85.0839	-34.65
280.0	9.99	50.62	86.63088	-36.01
285.0	9.85	50.80	88.17786	-37.38
290.0	9.72	50.98	89.72484	-38.75
295.0	9.58	51.15	91.27182	-40.12
300.0	9.46	51.33	92.8188	-41.49
305.0	9.33	51.50	94.36578	-42.87
310.0	9.21	51.67	95.91276	-44.24
315.0	9.10	51.84	97.45974	-45.62
320.0	8.98	52.00	99.00672	-47.01
325.0	8.87	52.16	100.5537	-48.39
330.0	8.76	52.32	102.10068	-49.78
335.0	8.66	52.48	103.64766	-51.17
340.0	8.56	52.64	105.19464	-52.56
345.0	8.46	52.79	106.74162	-53.95
350.0	8.36	52.94	108.2886	-55.34
355.0	8.27	53.09	109.83558	-56.74
360.0	8.17	53.24	111.38256	-58.14
Max Volume (V max):				19.99
Design Volume (V design) :				**19.99**

800 Palladium Dr.
Office Building

Sub-area F

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area **:** G 0.0326 ha
Runoff Coefficient C : 0.39
Rainfall Event : 5 yr
Discharge Flow Q : 0.000978 m³/s
Discharge Factor K : 1

Design Volume: **1.80 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

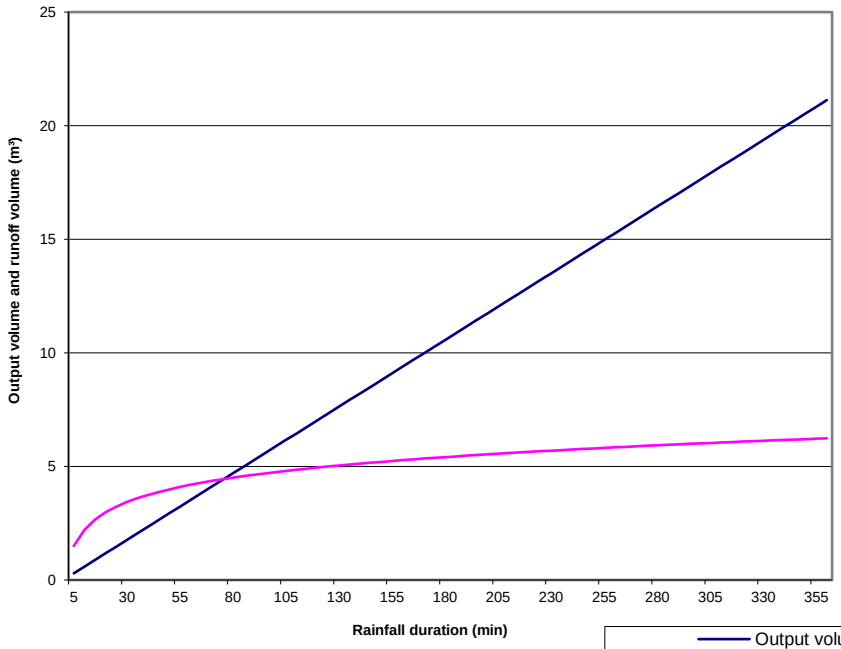
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	1.50	0.2934	1.20
10.0	104.19	2.21	0.5868	1.62
15.0	83.56	2.66	0.8802	1.78
20.0	70.25	2.98	1.1736	1.80
25.0	60.90	3.23	1.467	1.76
30.0	53.93	3.43	1.7604	1.67
35.0	48.52	3.60	2.0538	1.54
40.0	44.18	3.75	2.3472	1.40
45.0	40.63	3.87	2.6406	1.23
50.0	37.65	3.99	2.934	1.06
55.0	35.12	4.09	3.2274	0.87
60.0	32.94	4.19	3.5208	0.67
65.0	31.04	4.28	3.8142	0.46
70.0	29.37	4.36	4.1076	0.25
75.0	27.89	4.43	4.401	0.03
80.0	26.56	4.50	4.6944	-0.19
85.0	25.37	4.57	4.9878	-0.42
90.0	24.29	4.63	5.2812	-0.65
95.0	23.31	4.69	5.5746	-0.88
100.0	22.41	4.75	5.868	-1.12
105.0	21.58	4.80	6.1614	-1.36
110.0	20.82	4.85	6.4548	-1.60
115.0	20.12	4.90	6.7482	-1.85
120.0	19.47	4.95	7.0416	-2.09
125.0	18.86	5.00	7.335	-2.34
130.0	18.29	5.04	7.6284	-2.59
135.0	17.76	5.08	7.9218	-2.84
140.0	17.27	5.12	8.2152	-3.09
145.0	16.80	5.16	8.5086	-3.35
150.0	16.36	5.20	8.802	-3.60
155.0	15.95	5.24	9.0954	-3.86
160.0	15.56	5.27	9.3888	-4.11
165.0	15.18	5.31	9.6822	-4.37
170.0	14.83	5.34	9.9756	-4.63
175.0	14.50	5.38	10.269	-4.89
180.0	14.18	5.41	10.5624	-5.15
185.0	13.88	5.44	10.8558	-5.42
190.0	13.59	5.47	11.1492	-5.68
195.0	13.31	5.50	11.4426	-5.94
200.0	13.05	5.53	11.736	-6.21
205.0	12.80	5.56	12.0294	-6.47
210.0	12.56	5.59	12.3228	-6.74
215.0	12.32	5.61	12.6162	-7.00
220.0	12.10	5.64	12.9096	-7.27

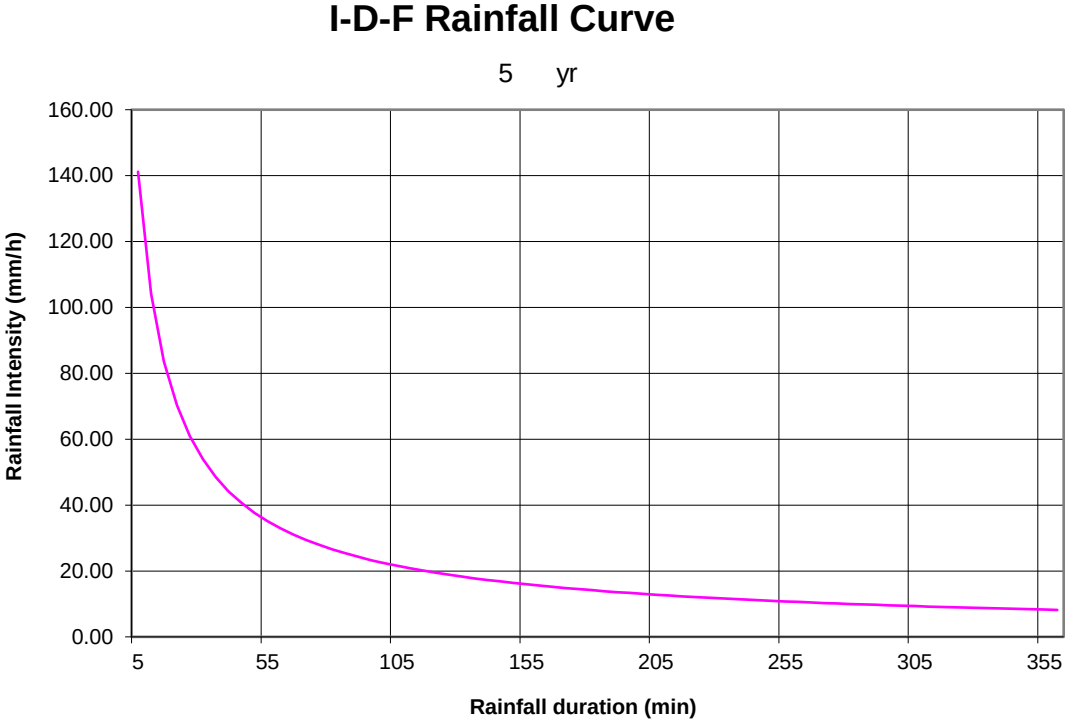
225.0	11.89	5.67	13.203	-7.54
230.0	11.68	5.69	13.4964	-7.80
235.0	11.48	5.72	13.7898	-8.07
240.0	11.29	5.74	14.0832	-8.34
245.0	11.11	5.77	14.3766	-8.61
250.0	10.93	5.79	14.67	-8.88
255.0	10.76	5.82	14.9634	-9.15
260.0	10.60	5.84	15.2568	-9.42
265.0	10.44	5.86	15.5502	-9.69
270.0	10.28	5.88	15.8436	-9.96
275.0	10.14	5.91	16.137	-10.23
280.0	9.99	5.93	16.4304	-10.50
285.0	9.85	5.95	16.7238	-10.77
290.0	9.72	5.97	17.0172	-11.05
295.0	9.58	5.99	17.3106	-11.32
300.0	9.46	6.01	17.604	-11.59
305.0	9.33	6.03	17.8974	-11.87
310.0	9.21	6.05	18.1908	-12.14
315.0	9.10	6.07	18.4842	-12.41
320.0	8.98	6.09	18.7776	-12.69
325.0	8.87	6.11	19.071	-12.96
330.0	8.76	6.13	19.3644	-13.24
335.0	8.66	6.15	19.6578	-13.51
340.0	8.56	6.16	19.9512	-13.79
345.0	8.46	6.18	20.2446	-14.06
350.0	8.36	6.20	20.538	-14.34
355.0	8.27	6.22	20.8314	-14.61
360.0	8.17	6.24	21.1248	-14.89
Max Volume (V max):				1.80
Design Volume (V design) :				**1.80**

800 Palladium Dr.
Office Building

Sub-area G

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area **:** H 0.0059 ha
Runoff Coefficient C : 0.9
Rainfall Event : 5 yr
Discharge Flow Q : 0.000177 m³/s
Discharge Factor K : 1

Design Volume: **1.14 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

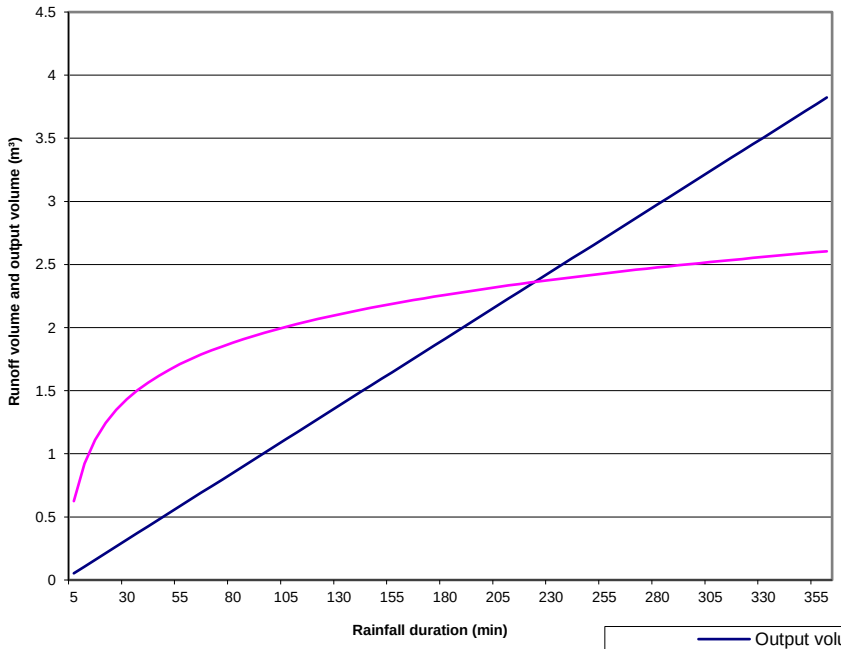
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	0.62	0.0531	0.57
10.0	104.19	0.92	0.1062	0.82
15.0	83.56	1.11	0.1593	0.95
20.0	70.25	1.24	0.2124	1.03
25.0	60.90	1.35	0.2655	1.08
30.0	53.93	1.43	0.3186	1.11
35.0	48.52	1.50	0.3717	1.13
40.0	44.18	1.56	0.4248	1.14
45.0	40.63	1.62	0.4779	1.14
50.0	37.65	1.67	0.531	1.14
55.0	35.12	1.71	0.5841	1.13
60.0	32.94	1.75	0.6372	1.11
65.0	31.04	1.79	0.6903	1.10
70.0	29.37	1.82	0.7434	1.08
75.0	27.89	1.85	0.7965	1.05
80.0	26.56	1.88	0.8496	1.03
85.0	25.37	1.91	0.9027	1.01
90.0	24.29	1.93	0.9558	0.98
95.0	23.31	1.96	1.0089	0.95
100.0	22.41	1.98	1.062	0.92
105.0	21.58	2.01	1.1151	0.89
110.0	20.82	2.03	1.1682	0.86
115.0	20.12	2.05	1.2213	0.83
120.0	19.47	2.07	1.2744	0.79
125.0	18.86	2.09	1.3275	0.76
130.0	18.29	2.10	1.3806	0.72
135.0	17.76	2.12	1.4337	0.69
140.0	17.27	2.14	1.4868	0.65
145.0	16.80	2.16	1.5399	0.62
150.0	16.36	2.17	1.593	0.58
155.0	15.95	2.19	1.6461	0.54
160.0	15.56	2.20	1.6992	0.50
165.0	15.18	2.22	1.7523	0.46
170.0	14.83	2.23	1.8054	0.43
175.0	14.50	2.25	1.8585	0.39
180.0	14.18	2.26	1.9116	0.35
185.0	13.88	2.27	1.9647	0.31
190.0	13.59	2.28	2.0178	0.27
195.0	13.31	2.30	2.0709	0.23
200.0	13.05	2.31	2.124	0.19
205.0	12.80	2.32	2.1771	0.14
210.0	12.56	2.33	2.2302	0.10
215.0	12.32	2.34	2.2833	0.06
220.0	12.10	2.36	2.3364	0.02

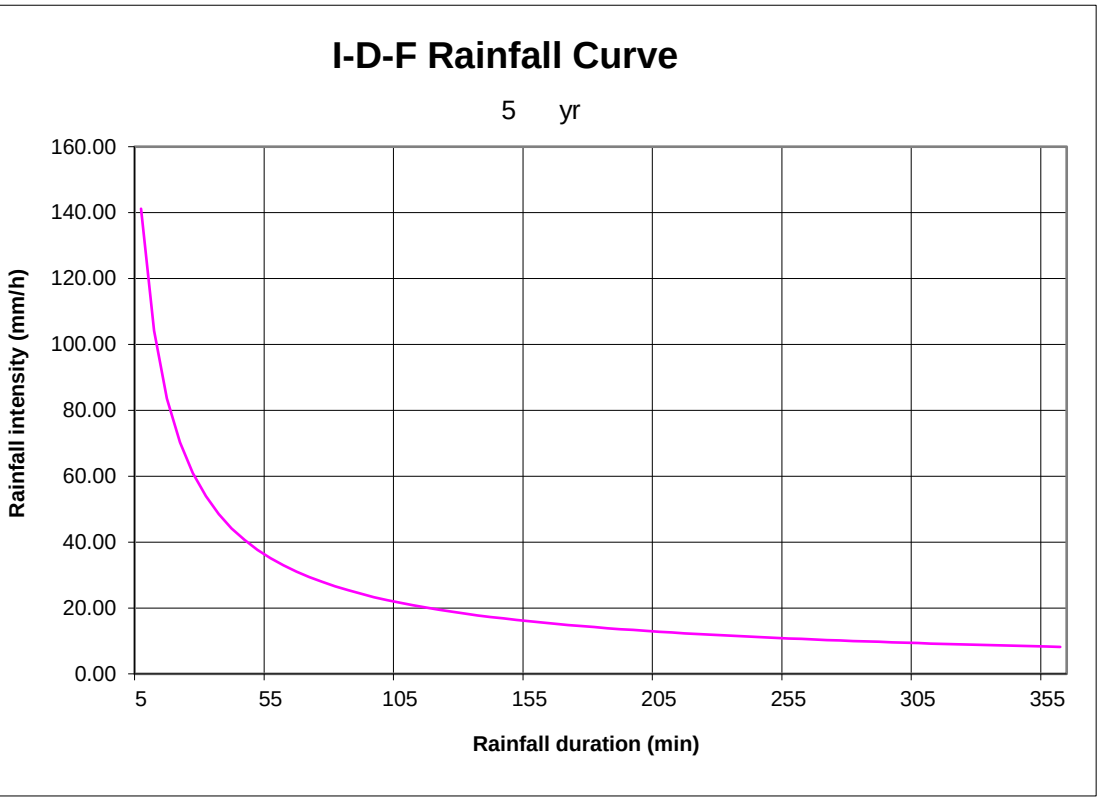
225.0	11.89	2.37	2.3895	-0.02
230.0	11.68	2.38	2.4426	-0.06
235.0	11.48	2.39	2.4957	-0.11
240.0	11.29	2.40	2.5488	-0.15
245.0	11.11	2.41	2.6019	-0.19
250.0	10.93	2.42	2.655	-0.24
255.0	10.76	2.43	2.7081	-0.28
260.0	10.60	2.44	2.7612	-0.32
265.0	10.44	2.45	2.8143	-0.37
270.0	10.28	2.46	2.8674	-0.41
275.0	10.14	2.47	2.9205	-0.45
280.0	9.99	2.48	2.9736	-0.50
285.0	9.85	2.48	3.0267	-0.54
290.0	9.72	2.49	3.0798	-0.59
295.0	9.58	2.50	3.1329	-0.63
300.0	9.46	2.51	3.186	-0.68
305.0	9.33	2.52	3.2391	-0.72
310.0	9.21	2.53	3.2922	-0.76
315.0	9.10	2.54	3.3453	-0.81
320.0	8.98	2.54	3.3984	-0.85
325.0	8.87	2.55	3.4515	-0.90
330.0	8.76	2.56	3.5046	-0.95
335.0	8.66	2.57	3.5577	-0.99
340.0	8.56	2.57	3.6108	-1.04
345.0	8.46	2.58	3.6639	-1.08
350.0	8.36	2.59	3.717	-1.13
355.0	8.27	2.60	3.7701	-1.17
360.0	8.17	2.60	3.8232	-1.22
Max Volume (V max):				1.14
Design Volume (V design) :				**1.14**

800 Palladium Dr.
Office Building

Sub-area H

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area : 0.0116 ha
Runoff Coefficient C : 0.2
Rainfall Event : 5 yr
Discharge Flow Q : 0.000348 m³/s
Discharge Factor K : 1

Design Volume: **0.19 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

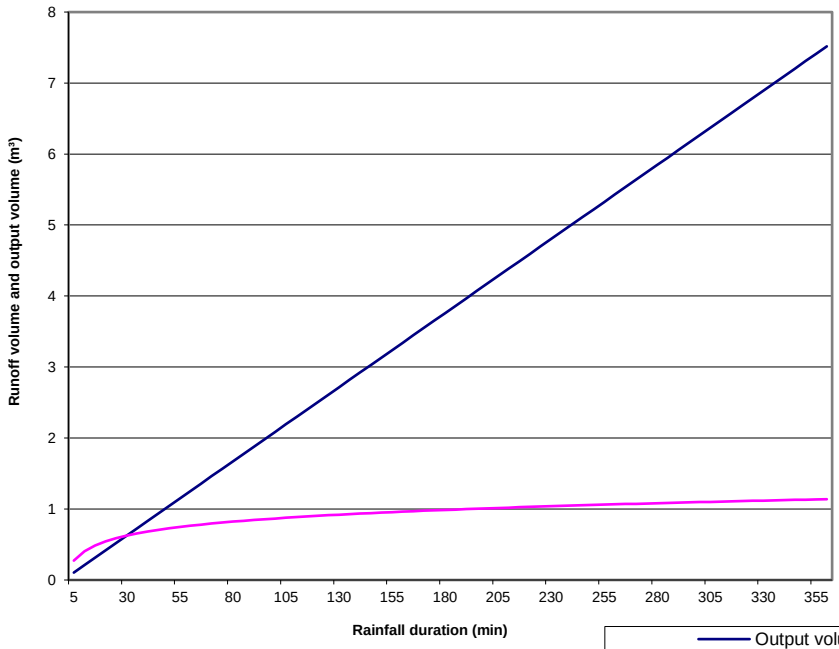
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	0.27	0.1044	0.17
10.0	104.19	0.40	0.2088	0.19
15.0	83.56	0.48	0.3132	0.17
20.0	70.25	0.54	0.4176	0.13
25.0	60.90	0.59	0.522	0.07
30.0	53.93	0.63	0.6264	0.00
35.0	48.52	0.66	0.7308	-0.07
40.0	44.18	0.68	0.8352	-0.15
45.0	40.63	0.71	0.9396	-0.23
50.0	37.65	0.73	1.044	-0.32
55.0	35.12	0.75	1.1484	-0.40
60.0	32.94	0.76	1.2528	-0.49
65.0	31.04	0.78	1.3572	-0.58
70.0	29.37	0.80	1.4616	-0.67
75.0	27.89	0.81	1.566	-0.76
80.0	26.56	0.82	1.6704	-0.85
85.0	25.37	0.83	1.7748	-0.94
90.0	24.29	0.85	1.8792	-1.03
95.0	23.31	0.86	1.9836	-1.13
100.0	22.41	0.87	2.088	-1.22
105.0	21.58	0.88	2.1924	-1.32
110.0	20.82	0.89	2.2968	-1.41
115.0	20.12	0.89	2.4012	-1.51
120.0	19.47	0.90	2.5056	-1.60
125.0	18.86	0.91	2.61	-1.70
130.0	18.29	0.92	2.7144	-1.79
135.0	17.76	0.93	2.8188	-1.89
140.0	17.27	0.93	2.9232	-1.99
145.0	16.80	0.94	3.0276	-2.09
150.0	16.36	0.95	3.132	-2.18
155.0	15.95	0.96	3.2364	-2.28
160.0	15.56	0.96	3.3408	-2.38
165.0	15.18	0.97	3.4452	-2.48
170.0	14.83	0.97	3.5496	-2.57
175.0	14.50	0.98	3.654	-2.67
180.0	14.18	0.99	3.7584	-2.77
185.0	13.88	0.99	3.8628	-2.87
190.0	13.59	1.00	3.9672	-2.97
195.0	13.31	1.00	4.0716	-3.07
200.0	13.05	1.01	4.176	-3.17
205.0	12.80	1.01	4.2804	-3.27
210.0	12.56	1.02	4.3848	-3.37
215.0	12.32	1.02	4.4892	-3.46
220.0	12.10	1.03	4.5936	-3.56

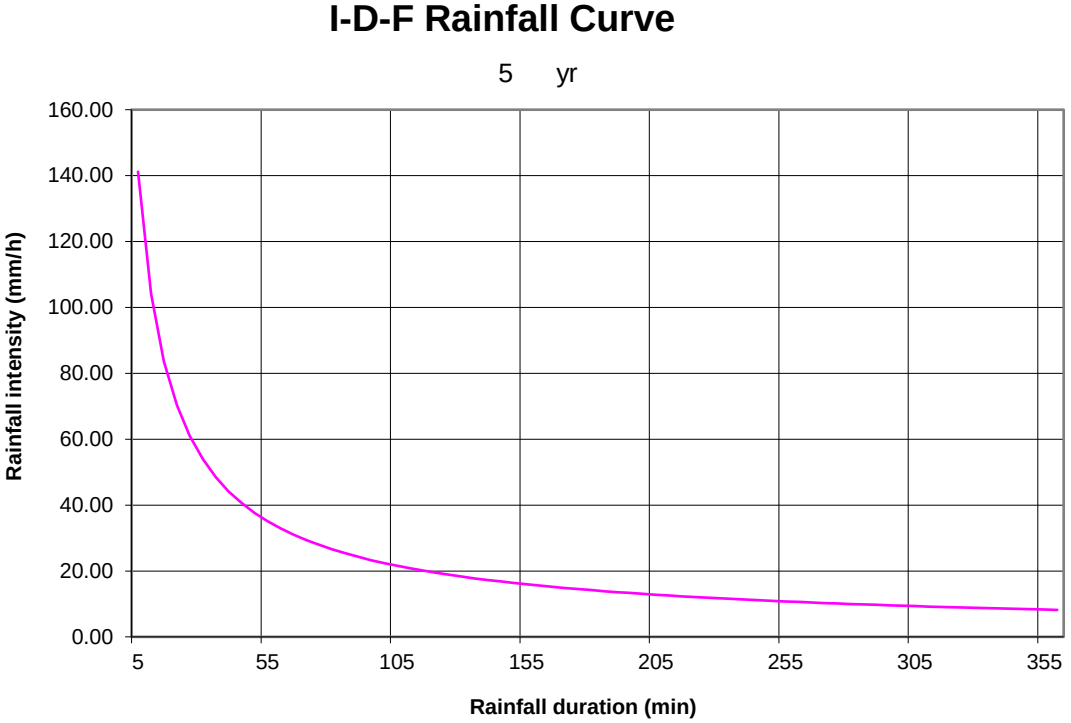
225.0	11.89	1.03	4.698	-3.66
230.0	11.68	1.04	4.8024	-3.76
235.0	11.48	1.04	4.9068	-3.86
240.0	11.29	1.05	5.0112	-3.96
245.0	11.11	1.05	5.1156	-4.06
250.0	10.93	1.06	5.22	-4.16
255.0	10.76	1.06	5.3244	-4.26
260.0	10.60	1.07	5.4288	-4.36
265.0	10.44	1.07	5.5332	-4.46
270.0	10.28	1.07	5.6376	-4.56
275.0	10.14	1.08	5.742	-4.66
280.0	9.99	1.08	5.8464	-4.76
285.0	9.85	1.09	5.9508	-4.87
290.0	9.72	1.09	6.0552	-4.97
295.0	9.58	1.09	6.1596	-5.07
300.0	9.46	1.10	6.264	-5.17
305.0	9.33	1.10	6.3684	-5.27
310.0	9.21	1.10	6.4728	-5.37
315.0	9.10	1.11	6.5772	-5.47
320.0	8.98	1.11	6.6816	-5.57
325.0	8.87	1.11	6.786	-5.67
330.0	8.76	1.12	6.8904	-5.77
335.0	8.66	1.12	6.9948	-5.87
340.0	8.56	1.12	7.0992	-5.97
345.0	8.46	1.13	7.2036	-6.08
350.0	8.36	1.13	7.308	-6.18
355.0	8.27	1.13	7.4124	-6.28
360.0	8.17	1.14	7.5168	-6.38
Max Volume (V max):				0.19
Design Volume (V design) :				**0.19**

800 Palladium Dr.
Office Building

Sub-area I

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area : J 0.0082 ha
Runoff Coefficient C : 0.7
Rainfall Event : 5 yr
Discharge Flow Q : 0.000246 m³/s
Discharge Factor K : 1

Design Volume: **1.11 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

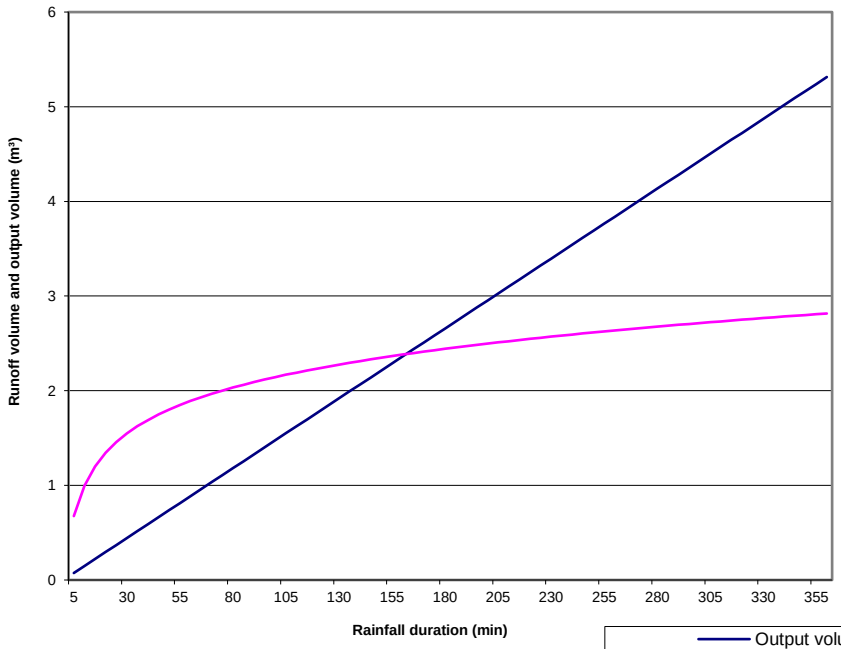
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	0.68	0.0738	0.60
10.0	104.19	1.00	0.1476	0.85
15.0	83.56	1.20	0.2214	0.98
20.0	70.25	1.34	0.2952	1.05
25.0	60.90	1.46	0.369	1.09
30.0	53.93	1.55	0.4428	1.10
35.0	48.52	1.62	0.5166	1.11
40.0	44.18	1.69	0.5904	1.10
45.0	40.63	1.75	0.6642	1.08
50.0	37.65	1.80	0.738	1.06
55.0	35.12	1.85	0.8118	1.04
60.0	32.94	1.89	0.8856	1.01
65.0	31.04	1.93	0.9594	0.97
70.0	29.37	1.97	1.0332	0.93
75.0	27.89	2.00	1.107	0.89
80.0	26.56	2.03	1.1808	0.85
85.0	25.37	2.06	1.2546	0.81
90.0	24.29	2.09	1.3284	0.76
95.0	23.31	2.12	1.4022	0.72
100.0	22.41	2.14	1.476	0.67
105.0	21.58	2.17	1.5498	0.62
110.0	20.82	2.19	1.6236	0.57
115.0	20.12	2.21	1.6974	0.52
120.0	19.47	2.23	1.7712	0.46
125.0	18.86	2.26	1.845	0.41
130.0	18.29	2.28	1.9188	0.36
135.0	17.76	2.29	1.9926	0.30
140.0	17.27	2.31	2.0664	0.25
145.0	16.80	2.33	2.1402	0.19
150.0	16.36	2.35	2.214	0.13
155.0	15.95	2.36	2.2878	0.08
160.0	15.56	2.38	2.3616	0.02
165.0	15.18	2.40	2.4354	-0.04
170.0	14.83	2.41	2.5092	-0.10
175.0	14.50	2.43	2.583	-0.16
180.0	14.18	2.44	2.6568	-0.21
185.0	13.88	2.46	2.7306	-0.27
190.0	13.59	2.47	2.8044	-0.33
195.0	13.31	2.48	2.8782	-0.39
200.0	13.05	2.50	2.952	-0.46
205.0	12.80	2.51	3.0258	-0.52
210.0	12.56	2.52	3.0996	-0.58
215.0	12.32	2.53	3.1734	-0.64
220.0	12.10	2.55	3.2472	-0.70

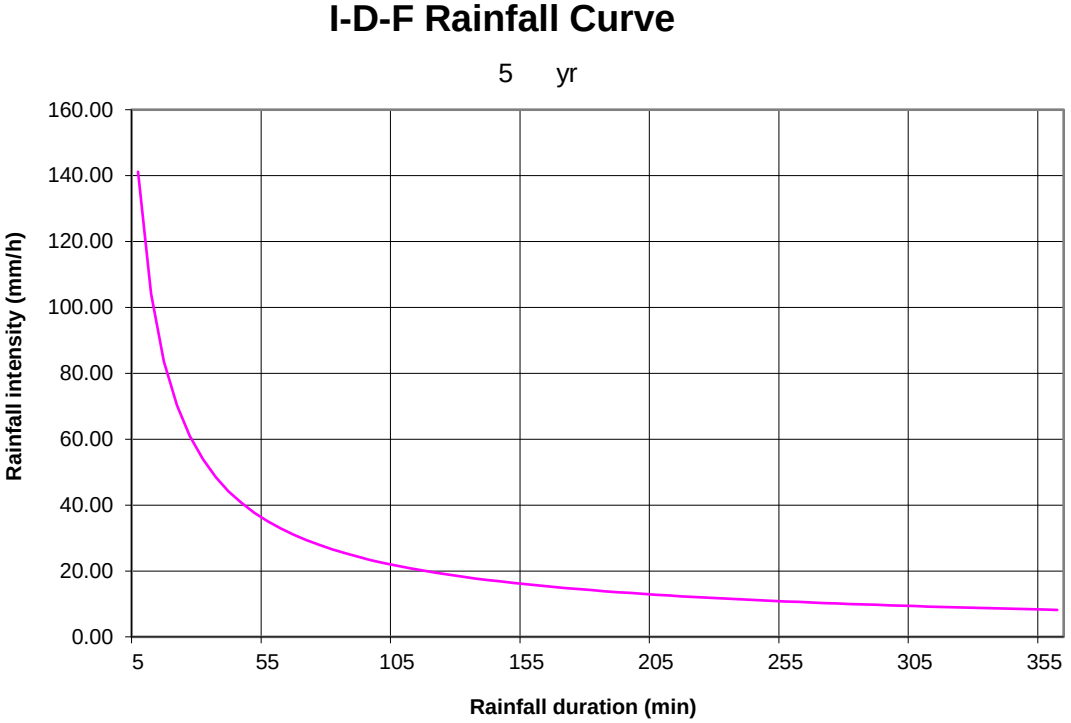
225.0	11.89	2.56	3.321	-0.76
230.0	11.68	2.57	3.3948	-0.82
235.0	11.48	2.58	3.4686	-0.89
240.0	11.29	2.59	3.5424	-0.95
245.0	11.11	2.60	3.6162	-1.01
250.0	10.93	2.62	3.69	-1.07
255.0	10.76	2.63	3.7638	-1.14
260.0	10.60	2.64	3.8376	-1.20
265.0	10.44	2.65	3.9114	-1.26
270.0	10.28	2.66	3.9852	-1.33
275.0	10.14	2.67	4.059	-1.39
280.0	9.99	2.68	4.1328	-1.46
285.0	9.85	2.69	4.2066	-1.52
290.0	9.72	2.70	4.2804	-1.58
295.0	9.58	2.70	4.3542	-1.65
300.0	9.46	2.71	4.428	-1.71
305.0	9.33	2.72	4.5018	-1.78
310.0	9.21	2.73	4.5756	-1.84
315.0	9.10	2.74	4.6494	-1.91
320.0	8.98	2.75	4.7232	-1.97
325.0	8.87	2.76	4.797	-2.04
330.0	8.76	2.77	4.8708	-2.10
335.0	8.66	2.77	4.9446	-2.17
340.0	8.56	2.78	5.0184	-2.24
345.0	8.46	2.79	5.0922	-2.30
350.0	8.36	2.80	5.166	-2.37
355.0	8.27	2.81	5.2398	-2.43
360.0	8.17	2.82	5.3136	-2.50
Max Volume (V max):				1.11
Design Volume (V design) :				**1.11**

800 Palladium Dr.
Office Building

Sub-area J

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area **:** K 0.0024 ha
Runoff Coefficient C : 0.9
Rainfall Event : 5 yr
Discharge Flow Q : 0.000072 m³/s
Discharge Factor K : 1

Design Volume: **0.46 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

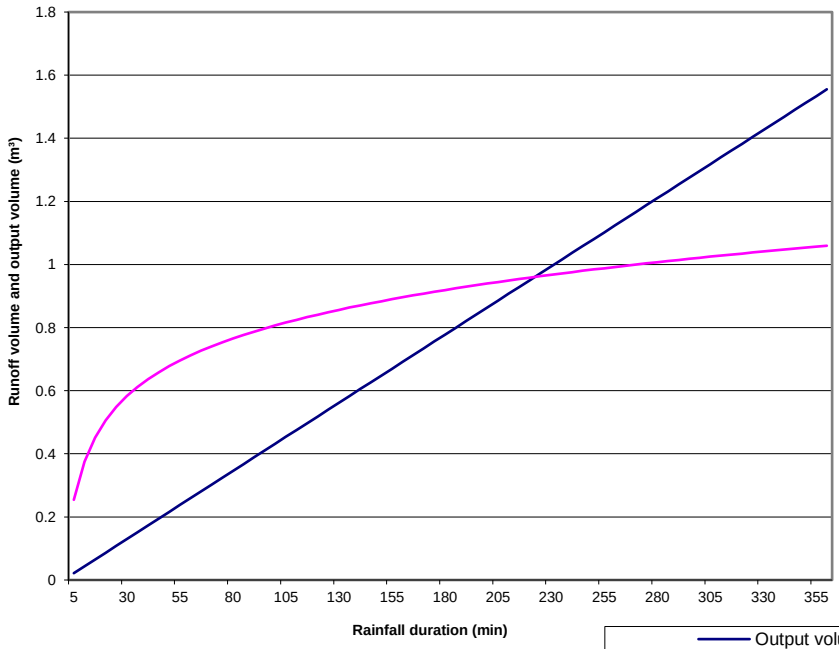
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	0.25	0.0216	0.23
10.0	104.19	0.38	0.0432	0.33
15.0	83.56	0.45	0.0648	0.39
20.0	70.25	0.51	0.0864	0.42
25.0	60.90	0.55	0.108	0.44
30.0	53.93	0.58	0.1296	0.45
35.0	48.52	0.61	0.1512	0.46
40.0	44.18	0.64	0.1728	0.46
45.0	40.63	0.66	0.1944	0.46
50.0	37.65	0.68	0.216	0.46
55.0	35.12	0.70	0.2376	0.46
60.0	32.94	0.71	0.2592	0.45
65.0	31.04	0.73	0.2808	0.45
70.0	29.37	0.74	0.3024	0.44
75.0	27.89	0.75	0.324	0.43
80.0	26.56	0.76	0.3456	0.42
85.0	25.37	0.78	0.3672	0.41
90.0	24.29	0.79	0.3888	0.40
95.0	23.31	0.80	0.4104	0.39
100.0	22.41	0.81	0.432	0.37
105.0	21.58	0.82	0.4536	0.36
110.0	20.82	0.82	0.4752	0.35
115.0	20.12	0.83	0.4968	0.34
120.0	19.47	0.84	0.5184	0.32
125.0	18.86	0.85	0.54	0.31
130.0	18.29	0.86	0.5616	0.29
135.0	17.76	0.86	0.5832	0.28
140.0	17.27	0.87	0.6048	0.27
145.0	16.80	0.88	0.6264	0.25
150.0	16.36	0.88	0.648	0.24
155.0	15.95	0.89	0.6696	0.22
160.0	15.56	0.90	0.6912	0.20
165.0	15.18	0.90	0.7128	0.19
170.0	14.83	0.91	0.7344	0.17
175.0	14.50	0.91	0.756	0.16
180.0	14.18	0.92	0.7776	0.14
185.0	13.88	0.92	0.7992	0.13
190.0	13.59	0.93	0.8208	0.11
195.0	13.31	0.93	0.8424	0.09
200.0	13.05	0.94	0.864	0.08
205.0	12.80	0.94	0.8856	0.06
210.0	12.56	0.95	0.9072	0.04
215.0	12.32	0.95	0.9288	0.03
220.0	12.10	0.96	0.9504	0.01

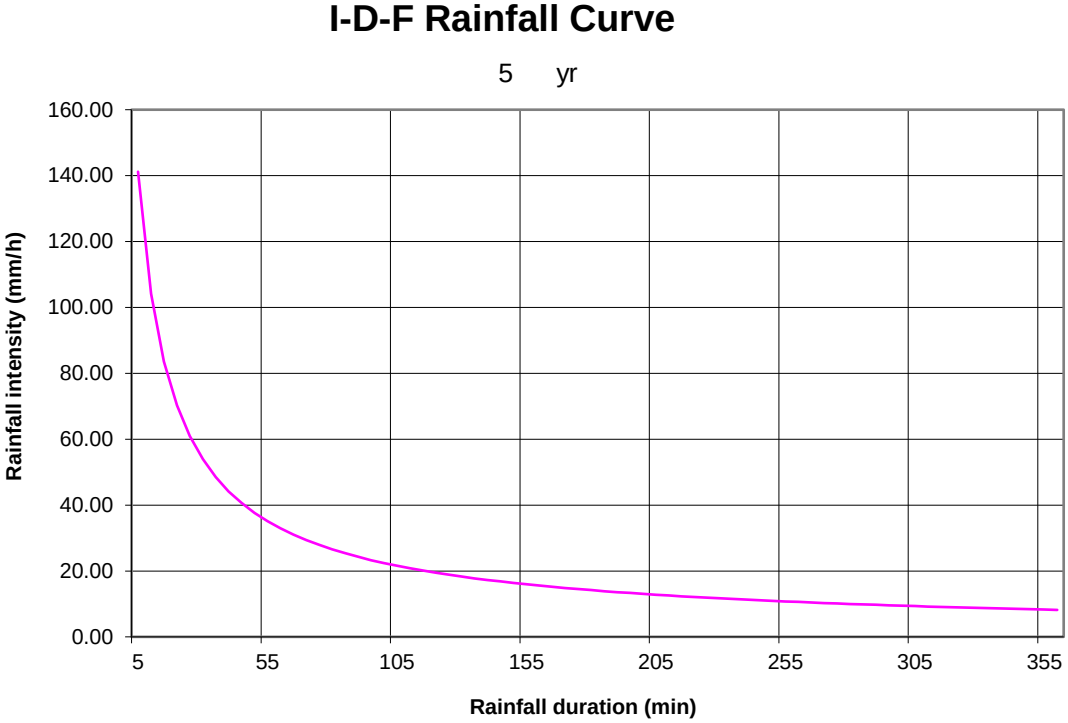
225.0	11.89	0.96	0.972	-0.01
230.0	11.68	0.97	0.9936	-0.03
235.0	11.48	0.97	1.0152	-0.04
240.0	11.29	0.98	1.0368	-0.06
245.0	11.11	0.98	1.0584	-0.08
250.0	10.93	0.98	1.08	-0.10
255.0	10.76	0.99	1.1016	-0.11
260.0	10.60	0.99	1.1232	-0.13
265.0	10.44	1.00	1.1448	-0.15
270.0	10.28	1.00	1.1664	-0.17
275.0	10.14	1.00	1.188	-0.18
280.0	9.99	1.01	1.2096	-0.20
285.0	9.85	1.01	1.2312	-0.22
290.0	9.72	1.01	1.2528	-0.24
295.0	9.58	1.02	1.2744	-0.26
300.0	9.46	1.02	1.296	-0.27
305.0	9.33	1.02	1.3176	-0.29
310.0	9.21	1.03	1.3392	-0.31
315.0	9.10	1.03	1.3608	-0.33
320.0	8.98	1.03	1.3824	-0.35
325.0	8.87	1.04	1.404	-0.37
330.0	8.76	1.04	1.4256	-0.38
335.0	8.66	1.04	1.4472	-0.40
340.0	8.56	1.05	1.4688	-0.42
345.0	8.46	1.05	1.4904	-0.44
350.0	8.36	1.05	1.512	-0.46
355.0	8.27	1.06	1.5336	-0.48
360.0	8.17	1.06	1.5552	-0.50
Max Volume (V max):				0.46
Design Volume (V design) :				**0.46**

800 Palladium Dr.
Office Building

Sub-area K

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area **:** L 0.0086 ha
Runoff Coefficient C : 0.72
Rainfall Event : 5 yr
Discharge Flow Q : 0.000258 m³/s
Discharge Factor K : 1

Design Volume: **1.21 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

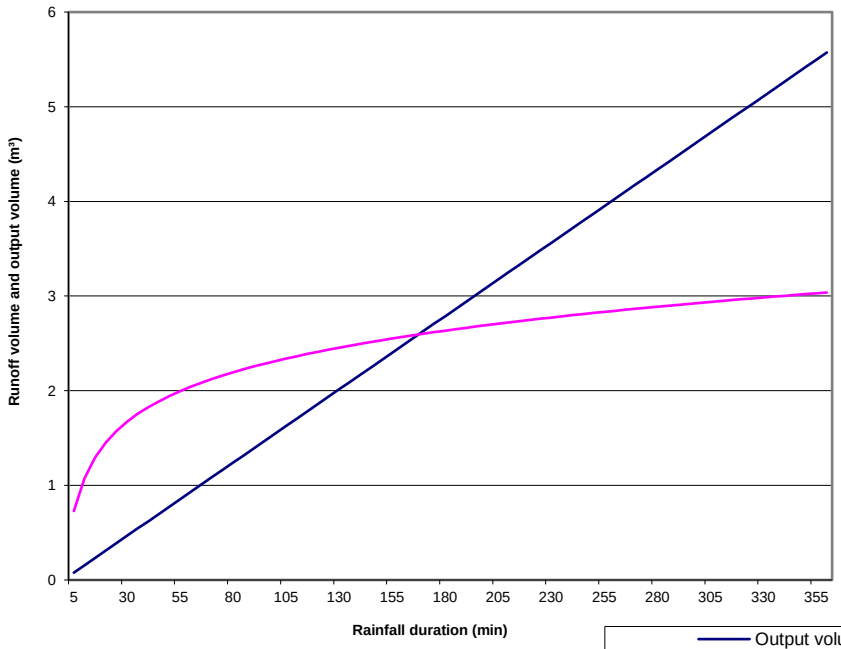
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	0.73	0.0774	0.65
10.0	104.19	1.08	0.1548	0.92
15.0	83.56	1.29	0.2322	1.06
20.0	70.25	1.45	0.3096	1.14
25.0	60.90	1.57	0.387	1.18
30.0	53.93	1.67	0.4644	1.21
35.0	48.52	1.75	0.5418	1.21
40.0	44.18	1.82	0.6192	1.20
45.0	40.63	1.89	0.6966	1.19
50.0	37.65	1.94	0.774	1.17
55.0	35.12	1.99	0.8514	1.14
60.0	32.94	2.04	0.9288	1.11
65.0	31.04	2.08	1.0062	1.08
70.0	29.37	2.12	1.0836	1.04
75.0	27.89	2.16	1.161	1.00
80.0	26.56	2.19	1.2384	0.95
85.0	25.37	2.23	1.3158	0.91
90.0	24.29	2.26	1.3932	0.86
95.0	23.31	2.28	1.4706	0.81
100.0	22.41	2.31	1.548	0.76
105.0	21.58	2.34	1.6254	0.71
110.0	20.82	2.36	1.7028	0.66
115.0	20.12	2.39	1.7802	0.61
120.0	19.47	2.41	1.8576	0.55
125.0	18.86	2.43	1.935	0.50
130.0	18.29	2.45	2.0124	0.44
135.0	17.76	2.48	2.0898	0.39
140.0	17.27	2.49	2.1672	0.33
145.0	16.80	2.51	2.2446	0.27
150.0	16.36	2.53	2.322	0.21
155.0	15.95	2.55	2.3994	0.15
160.0	15.56	2.57	2.4768	0.09
165.0	15.18	2.59	2.5542	0.03
170.0	14.83	2.60	2.6316	-0.03
175.0	14.50	2.62	2.709	-0.09
180.0	14.18	2.63	2.7864	-0.15
185.0	13.88	2.65	2.8638	-0.21
190.0	13.59	2.66	2.9412	-0.28
195.0	13.31	2.68	3.0186	-0.34
200.0	13.05	2.69	3.096	-0.40
205.0	12.80	2.71	3.1734	-0.47
210.0	12.56	2.72	3.2508	-0.53
215.0	12.32	2.73	3.3282	-0.59
220.0	12.10	2.75	3.4056	-0.66

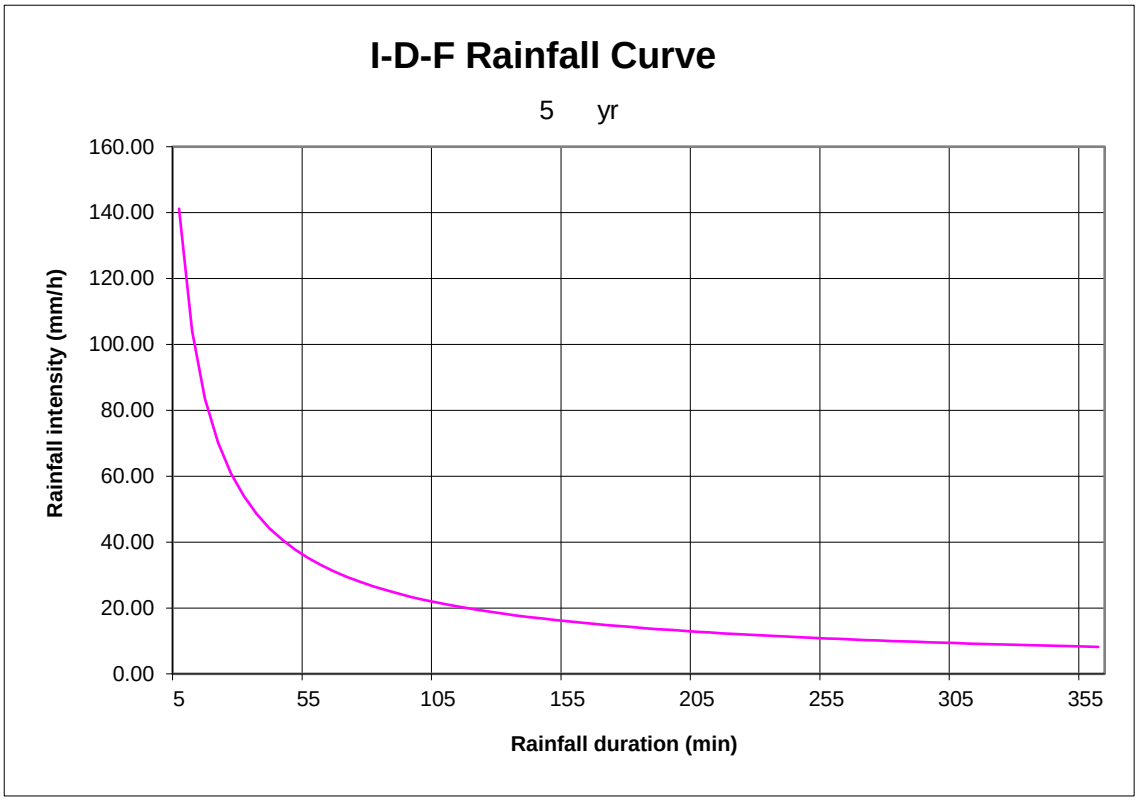
225.0	11.89	2.76	3.483	-0.72
230.0	11.68	2.77	3.5604	-0.79
235.0	11.48	2.79	3.6378	-0.85
240.0	11.29	2.80	3.7152	-0.92
245.0	11.11	2.81	3.7926	-0.98
250.0	10.93	2.82	3.87	-1.05
255.0	10.76	2.83	3.9474	-1.11
260.0	10.60	2.84	4.0248	-1.18
265.0	10.44	2.85	4.1022	-1.25
270.0	10.28	2.87	4.1796	-1.31
275.0	10.14	2.88	4.257	-1.38
280.0	9.99	2.89	4.3344	-1.45
285.0	9.85	2.90	4.4118	-1.51
290.0	9.72	2.91	4.4892	-1.58
295.0	9.58	2.92	4.5666	-1.65
300.0	9.46	2.93	4.644	-1.72
305.0	9.33	2.94	4.7214	-1.78
310.0	9.21	2.95	4.7988	-1.85
315.0	9.10	2.96	4.8762	-1.92
320.0	8.98	2.97	4.9536	-1.99
325.0	8.87	2.98	5.031	-2.06
330.0	8.76	2.98	5.1084	-2.12
335.0	8.66	2.99	5.1858	-2.19
340.0	8.56	3.00	5.2632	-2.26
345.0	8.46	3.01	5.3406	-2.33
350.0	8.36	3.02	5.418	-2.40
355.0	8.27	3.03	5.4954	-2.47
360.0	8.17	3.04	5.5728	-2.54
Max Volume (V max):				1.21
Design Volume (V design) :				**1.21**

800 Palladium Dr.
Office Building

Sub-area L

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area **:** M 0.0151 ha
Runoff Coefficient C : 0.2
Rainfall Event : 5 yr
Discharge Flow Q : 0.000453 m³/s
Discharge Factor K : 1

Design Volume: **0.25 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

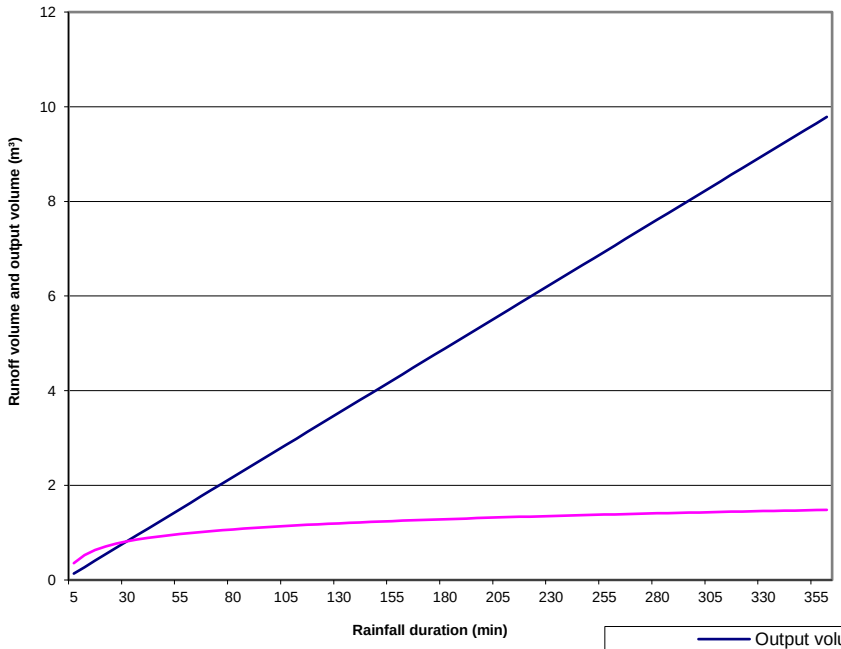
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	0.36	0.1359	0.22
10.0	104.19	0.52	0.2718	0.25
15.0	83.56	0.63	0.4077	0.22
20.0	70.25	0.71	0.5436	0.16
25.0	60.90	0.77	0.6795	0.09
30.0	53.93	0.81	0.8154	0.00
35.0	48.52	0.85	0.9513	-0.10
40.0	44.18	0.89	1.0872	-0.20
45.0	40.63	0.92	1.2231	-0.30
50.0	37.65	0.95	1.359	-0.41
55.0	35.12	0.97	1.4949	-0.52
60.0	32.94	0.99	1.6308	-0.64
65.0	31.04	1.02	1.7667	-0.75
70.0	29.37	1.03	1.9026	-0.87
75.0	27.89	1.05	2.0385	-0.99
80.0	26.56	1.07	2.1744	-1.10
85.0	25.37	1.09	2.3103	-1.22
90.0	24.29	1.10	2.4462	-1.35
95.0	23.31	1.11	2.5821	-1.47
100.0	22.41	1.13	2.718	-1.59
105.0	21.58	1.14	2.8539	-1.71
110.0	20.82	1.15	2.9898	-1.84
115.0	20.12	1.16	3.1257	-1.96
120.0	19.47	1.18	3.2616	-2.09
125.0	18.86	1.19	3.3975	-2.21
130.0	18.29	1.20	3.5334	-2.34
135.0	17.76	1.21	3.6693	-2.46
140.0	17.27	1.22	3.8052	-2.59
145.0	16.80	1.23	3.9411	-2.71
150.0	16.36	1.24	4.077	-2.84
155.0	15.95	1.24	4.2129	-2.97
160.0	15.56	1.25	4.3488	-3.10
165.0	15.18	1.26	4.4847	-3.22
170.0	14.83	1.27	4.6206	-3.35
175.0	14.50	1.28	4.7565	-3.48
180.0	14.18	1.28	4.8924	-3.61
185.0	13.88	1.29	5.0283	-3.74
190.0	13.59	1.30	5.1642	-3.86
195.0	13.31	1.31	5.3001	-3.99
200.0	13.05	1.31	5.436	-4.12
205.0	12.80	1.32	5.5719	-4.25
210.0	12.56	1.33	5.7078	-4.38
215.0	12.32	1.33	5.8437	-4.51
220.0	12.10	1.34	5.9796	-4.64

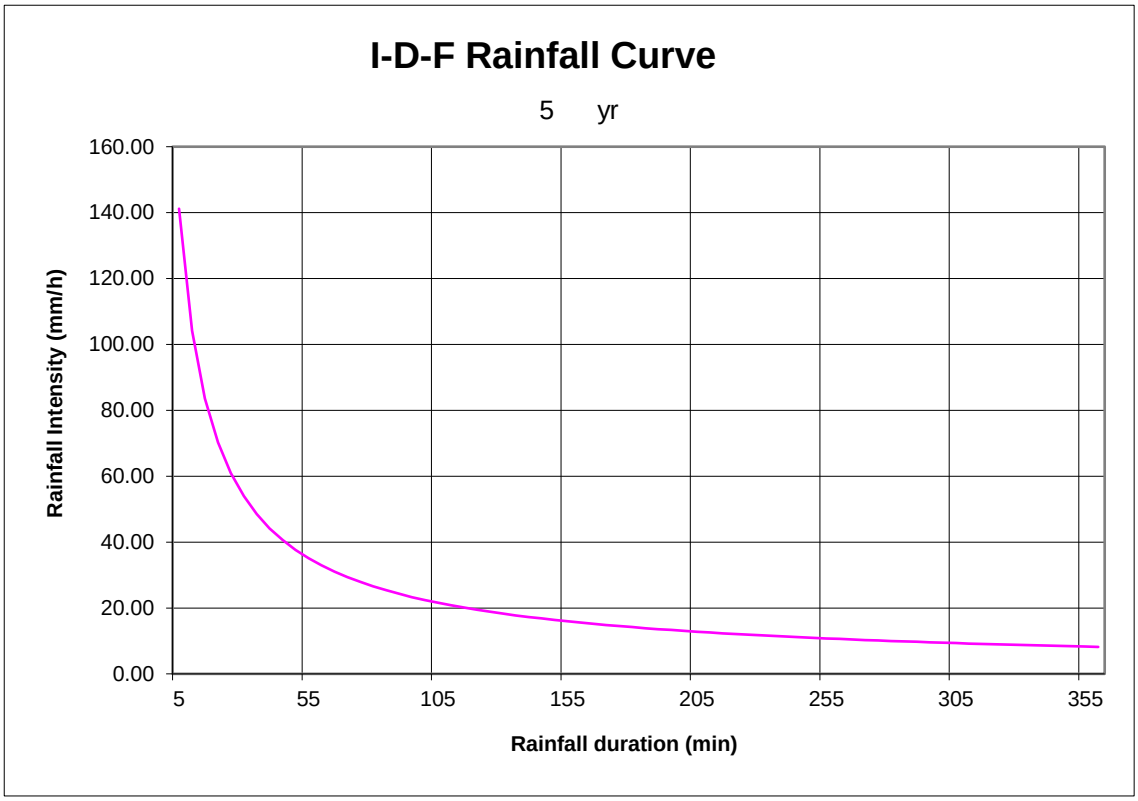
225.0	11.89	1.35	6.1155	-4.77
230.0	11.68	1.35	6.2514	-4.90
235.0	11.48	1.36	6.3873	-5.03
240.0	11.29	1.36	6.5232	-5.16
245.0	11.11	1.37	6.6591	-5.29
250.0	10.93	1.38	6.795	-5.42
255.0	10.76	1.38	6.9309	-5.55
260.0	10.60	1.39	7.0668	-5.68
265.0	10.44	1.39	7.2027	-5.81
270.0	10.28	1.40	7.3386	-5.94
275.0	10.14	1.40	7.4745	-6.07
280.0	9.99	1.41	7.6104	-6.20
285.0	9.85	1.41	7.7463	-6.33
290.0	9.72	1.42	7.8822	-6.46
295.0	9.58	1.42	8.0181	-6.60
300.0	9.46	1.43	8.154	-6.73
305.0	9.33	1.43	8.2899	-6.86
310.0	9.21	1.44	8.4258	-6.99
315.0	9.10	1.44	8.5617	-7.12
320.0	8.98	1.45	8.6976	-7.25
325.0	8.87	1.45	8.8335	-7.38
330.0	8.76	1.46	8.9694	-7.51
335.0	8.66	1.46	9.1053	-7.65
340.0	8.56	1.46	9.2412	-7.78
345.0	8.46	1.47	9.3771	-7.91
350.0	8.36	1.47	9.513	-8.04
355.0	8.27	1.48	9.6489	-8.17
360.0	8.17	1.48	9.7848	-8.30
Max Volume (V max):				0.25
Design Volume (V design) :				**0.25**

800 Palladium Dr.
Office Building

Sub-area M

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:46

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area	**:**	Building	0.2768	ha
Runoff Coefficient C :			0.9	
Rainfall Event :			5	yr
Discharge Flow Q :			0.008304	m³/s
Discharge Factor K :			1	

Design Volume: **53.49 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

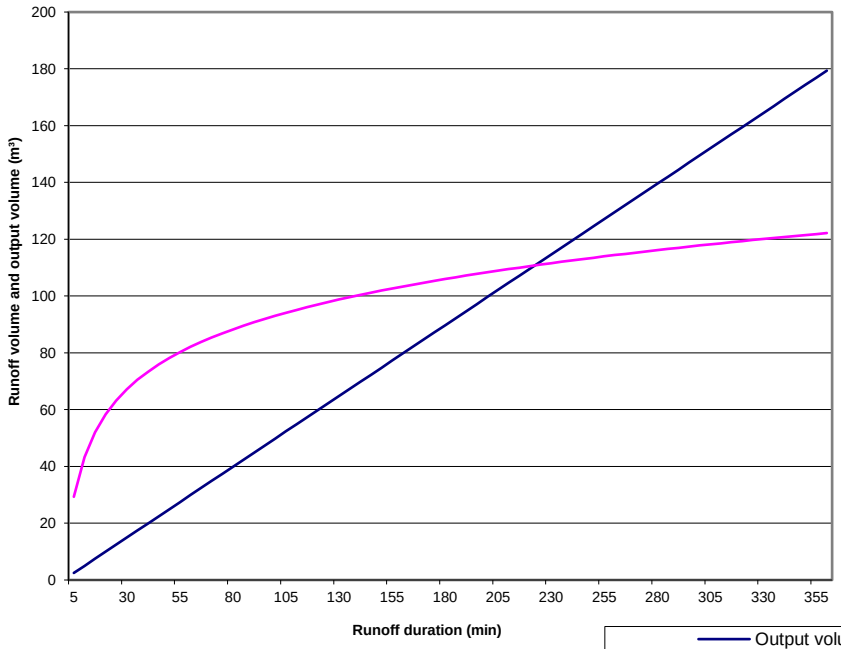
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	141.18	29.31	2.4912	26.82
10.0	104.19	43.26	4.9824	38.28
15.0	83.56	52.04	7.4736	44.57
20.0	70.25	58.34	9.9648	48.37
25.0	60.90	63.21	12.456	50.75
30.0	53.93	67.17	14.9472	52.23
35.0	48.52	70.51	17.4384	53.07
40.0	44.18	73.38	19.9296	53.45
45.0	40.63	75.91	22.4208	53.49
50.0	37.65	78.17	24.912	53.26
55.0	35.12	80.21	27.4032	52.80
60.0	32.94	82.07	29.8944	52.17
65.0	31.04	83.78	32.3856	51.40
70.0	29.37	85.37	34.8768	50.49
75.0	27.89	86.84	37.368	49.48
80.0	26.56	88.23	39.8592	48.37
85.0	25.37	89.53	42.3504	47.18
90.0	24.29	90.76	44.8416	45.92
95.0	23.31	91.93	47.3328	44.59
100.0	22.41	93.03	49.824	43.21
105.0	21.58	94.09	52.3152	41.78
110.0	20.82	95.10	54.8064	40.29
115.0	20.12	96.07	57.2976	38.77
120.0	19.47	97.00	59.7888	37.21
125.0	18.86	97.89	62.28	35.61
130.0	18.29	98.75	64.7712	33.98
135.0	17.76	99.58	67.2624	32.31
140.0	17.27	100.38	69.7536	30.62
145.0	16.80	101.15	72.2448	28.91
150.0	16.36	101.90	74.736	27.17
155.0	15.95	102.63	77.2272	25.40
160.0	15.56	103.34	79.7184	23.62
165.0	15.18	104.02	82.2096	21.81
170.0	14.83	104.69	84.7008	19.99
175.0	14.50	105.34	87.192	18.15
180.0	14.18	105.98	89.6832	16.29
185.0	13.88	106.59	92.1744	14.42
190.0	13.59	107.20	94.6656	12.53
195.0	13.31	107.79	97.1568	10.63
200.0	13.05	108.36	99.648	8.71
205.0	12.80	108.92	102.1392	6.78
210.0	12.56	109.47	104.6304	4.84
215.0	12.32	110.01	107.1216	2.89
220.0	12.10	110.54	109.6128	0.93

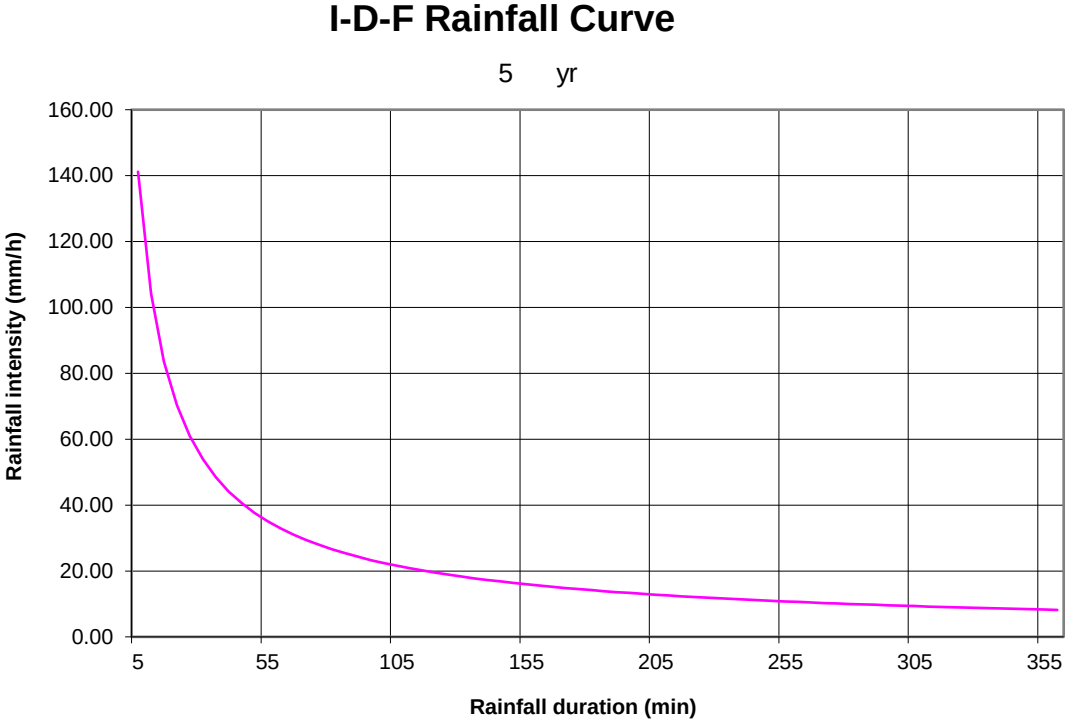
225.0	11.89	111.06	112.104	-1.05
230.0	11.68	111.56	114.5952	-3.03
235.0	11.48	112.06	117.0864	-5.03
240.0	11.29	112.55	119.5776	-7.03
245.0	11.11	113.03	122.0688	-9.04
250.0	10.93	113.50	124.56	-11.06
255.0	10.76	113.96	127.0512	-13.09
260.0	10.60	114.41	129.5424	-15.13
265.0	10.44	114.86	132.0336	-17.18
270.0	10.28	115.30	134.5248	-19.23
275.0	10.14	115.73	137.016	-21.29
280.0	9.99	116.15	139.5072	-23.35
285.0	9.85	116.57	141.9984	-25.43
290.0	9.72	116.98	144.4896	-27.51
295.0	9.58	117.39	146.9808	-29.59
300.0	9.46	117.79	149.472	-31.68
305.0	9.33	118.18	151.9632	-33.78
310.0	9.21	118.57	154.4544	-35.88
315.0	9.10	118.95	156.9456	-37.99
320.0	8.98	119.33	159.4368	-40.11
325.0	8.87	119.70	161.928	-42.22
330.0	8.76	120.07	164.4192	-44.35
335.0	8.66	120.43	166.9104	-46.48
340.0	8.56	120.79	169.4016	-48.61
345.0	8.46	121.14	171.8928	-50.75
350.0	8.36	121.49	174.384	-52.89
355.0	8.27	121.84	176.8752	-55.04
360.0	8.17	122.18	179.3664	-57.19
Max Volume (V max):				53.49
Design Volume (V design) :				**53.49**

800 Palladium Dr.
Office Building

Sub-area Building

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 37.62 L/s/ha

Area : A 0.1822 ha
Runoff Coefficient C : 0.95
Rainfall Event : 100 year
Discharge Flow Q : 0.006854364 m³/s
Discharge Factor K : 1

Design Volume: **72.07 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.810	0.810	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.820	0.820	0.820	0.820

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

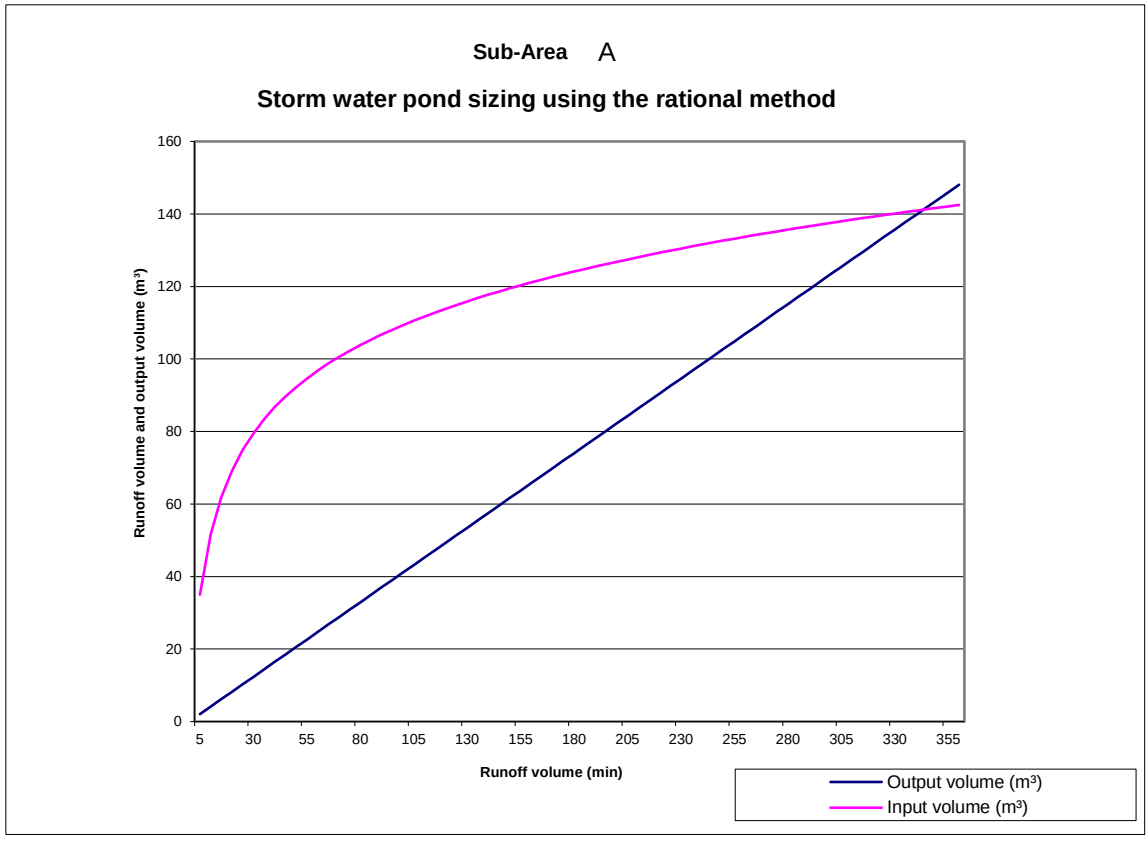
Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

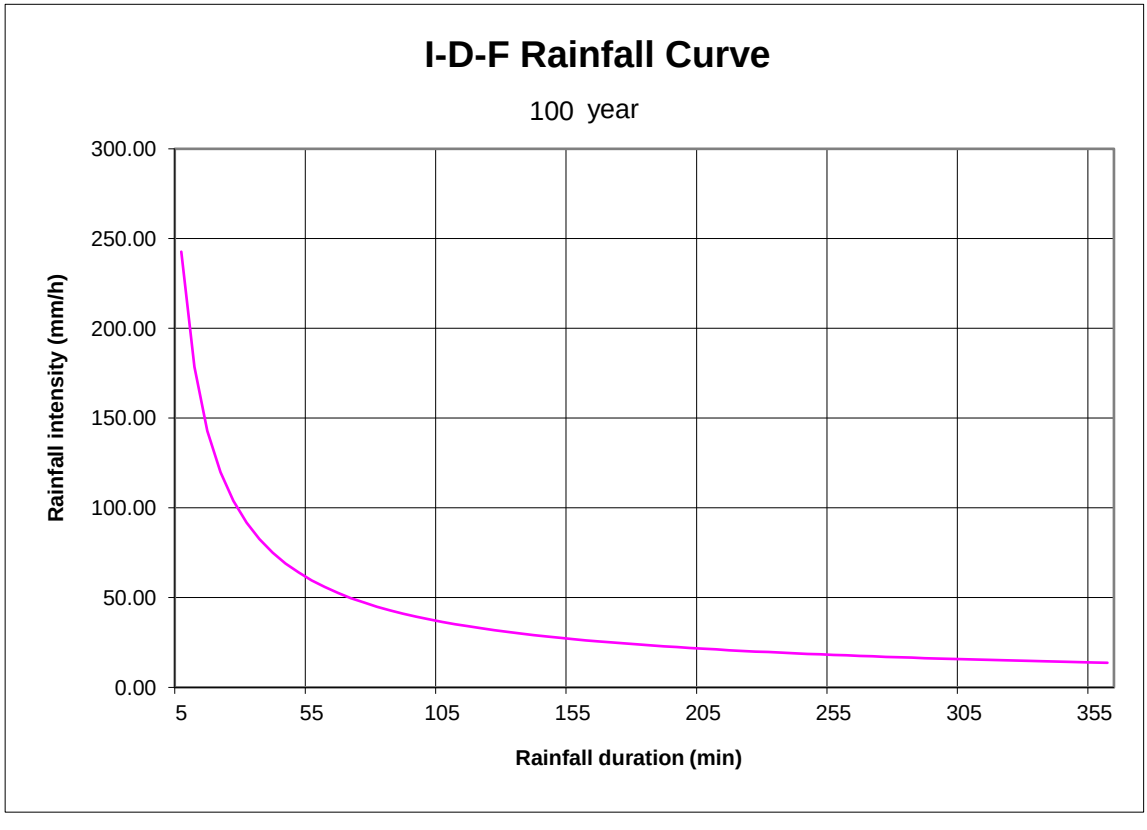
Init._____

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	35.01	2.0563092	32.95
10.0	178.56	51.51	4.1126184	47.40
15.0	142.89	61.83	6.1689276	55.66
20.0	119.95	69.21	8.2252368	60.98
25.0	103.85	74.90	10.281546	64.61
30.0	91.87	79.51	12.3378552	67.17
35.0	82.58	83.38	14.3941644	68.98
40.0	75.15	86.71	16.4504736	70.26
45.0	69.05	89.64	18.5067828	71.13
50.0	63.95	92.25	20.563092	71.69
55.0	59.62	94.60	22.6194012	71.98
60.0	55.89	96.75	24.6757104	72.07
65.0	52.65	98.72	26.7320196	71.99
70.0	49.79	100.54	28.7883288	71.76
75.0	47.26	102.24	30.844638	71.40
80.0	44.99	103.83	32.9009472	70.93
85.0	42.95	105.33	34.9572564	70.37
90.0	41.11	106.74	37.0135656	69.72
95.0	39.43	108.07	39.0698748	69.00
100.0	37.90	109.34	41.126184	68.22
105.0	36.50	110.55	43.1824932	67.37
110.0	35.20	111.71	45.2388024	66.47
115.0	34.01	112.81	47.2951116	65.52
120.0	32.89	113.88	49.3514208	64.52
125.0	31.86	114.90	51.40773	63.49
130.0	30.90	115.88	53.4640392	62.41
135.0	30.00	116.82	55.5203484	61.30
140.0	29.15	117.74	57.5766576	60.16
145.0	28.36	118.62	59.6329668	58.99
150.0	27.61	119.48	61.689276	57.79
155.0	26.91	120.31	63.7455852	56.56
160.0	26.24	121.11	65.8018944	55.31
165.0	25.61	121.90	67.8582036	54.04
170.0	25.01	122.66	69.9145128	52.74
175.0	24.44	123.40	71.970822	51.43
180.0	23.90	124.12	74.0271312	50.09
185.0	23.39	124.82	76.0834404	48.74
190.0	22.90	125.51	78.1397496	47.37
195.0	22.43	126.18	80.1960588	45.98
200.0	21.98	126.83	82.252368	44.58
205.0	21.55	127.47	84.3086772	43.16
210.0	21.14	128.10	86.3649864	41.73
215.0	20.75	128.71	88.4212956	40.29
220.0	20.37	129.31	90.4776048	38.83

225.0	20.01	129.89	92.533914	37.36
230.0	19.66	130.47	94.5902232	35.88
235.0	19.33	131.03	96.6465324	34.39
240.0	19.01	131.59	98.7028416	32.89
245.0	18.69	132.13	100.759151	31.37
250.0	18.39	132.66	102.81546	29.85
255.0	18.11	133.19	104.871769	28.32
260.0	17.83	133.70	106.928078	26.78
265.0	17.56	134.21	108.984388	25.23
270.0	17.29	134.71	111.040697	23.67
275.0	17.04	135.20	113.097006	22.10
280.0	16.80	135.68	115.153315	20.53
285.0	16.56	136.15	117.209624	18.94
290.0	16.33	136.62	119.265934	17.35
295.0	16.11	137.08	121.322243	15.76
300.0	15.89	137.53	123.378552	14.15
305.0	15.68	137.98	125.434861	12.54
310.0	15.48	138.42	127.49117	10.93
315.0	15.28	138.85	129.54748	9.30
320.0	15.09	139.28	131.603789	7.68
325.0	14.90	139.70	133.660098	6.04
330.0	14.72	140.12	135.716407	4.40
335.0	14.54	140.53	137.772716	2.76
340.0	14.37	140.93	139.829026	1.10
345.0	14.20	141.33	141.885335	-0.55
350.0	14.04	141.73	143.941644	-2.21
355.0	13.88	142.12	145.997953	-3.88
360.0	13.72	142.50	148.054262	-5.55
Max Volume (V max):				72.07
Design Volume (V design) :				**72.07**

800 Palladium Dr.
Office Building





Init._____

STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 37.62 L/s/ha

Area : B 0.1722 ha
Runoff Coefficient C : 0.95
Rainfall Event : 100 year
Discharge Flow Q : 0.006478164 m³/s
Discharge Factor K : 1

Design Volume: **68.12 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

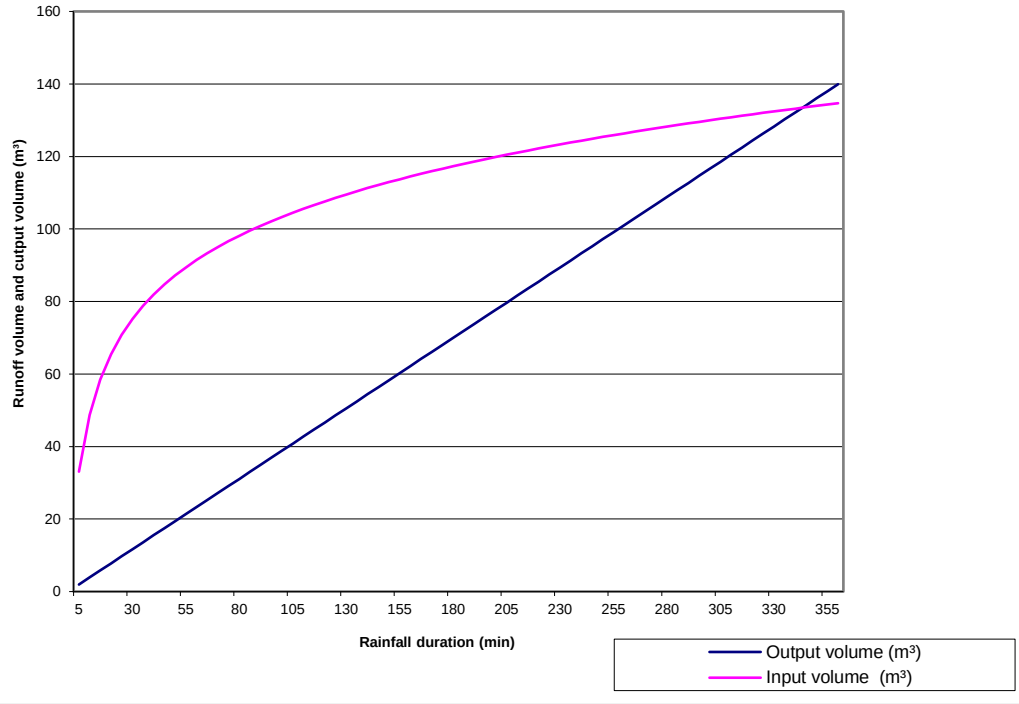
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	33.09	1.9434492	31.14
10.0	178.56	48.68	3.8868984	44.80
15.0	142.89	58.44	5.8303476	52.61
20.0	119.95	65.41	7.7737968	57.64
25.0	103.85	70.78	9.717246	61.07
30.0	91.87	75.14	11.6606952	63.48
35.0	82.58	78.80	13.6041444	65.20
40.0	75.15	81.95	15.5475936	66.41
45.0	69.05	84.72	17.4910428	67.23
50.0	63.95	87.19	19.434492	67.75
55.0	59.62	89.41	21.3779412	68.03
60.0	55.89	91.44	23.3213904	68.12
65.0	52.65	93.30	25.2648396	68.04
70.0	49.79	95.03	27.2082888	67.82
75.0	47.26	96.63	29.151738	67.48
80.0	44.99	98.13	31.0951872	67.04
85.0	42.95	99.55	33.0386364	66.51
90.0	41.11	100.88	34.9820856	65.90
95.0	39.43	102.14	36.9255348	65.22
100.0	37.90	103.34	38.868984	64.47
105.0	36.50	104.49	40.8124332	63.67
110.0	35.20	105.58	42.7558824	62.82
115.0	34.01	106.62	44.6993316	61.92
120.0	32.89	107.63	46.6427808	60.98
125.0	31.86	108.59	48.58623	60.00
130.0	30.90	109.52	50.5296792	58.99
135.0	30.00	110.41	52.4731284	57.94
140.0	29.15	111.28	54.4165776	56.86
145.0	28.36	112.11	56.3600268	55.75
150.0	27.61	112.92	58.303476	54.62
155.0	26.91	113.71	60.2469252	53.46
160.0	26.24	114.47	62.1903744	52.28
165.0	25.61	115.21	64.1338236	51.07
170.0	25.01	115.93	66.0772728	49.85
175.0	24.44	116.62	68.020722	48.60
180.0	23.90	117.31	69.9641712	47.34
185.0	23.39	117.97	71.9076204	46.06
190.0	22.90	118.62	73.8510696	44.77
195.0	22.43	119.25	75.7945188	43.46
200.0	21.98	119.87	77.737968	42.13
205.0	21.55	120.47	79.6814172	40.79
210.0	21.14	121.07	81.6248664	39.44
215.0	20.75	121.64	83.5683156	38.08
220.0	20.37	122.21	85.5117648	36.70

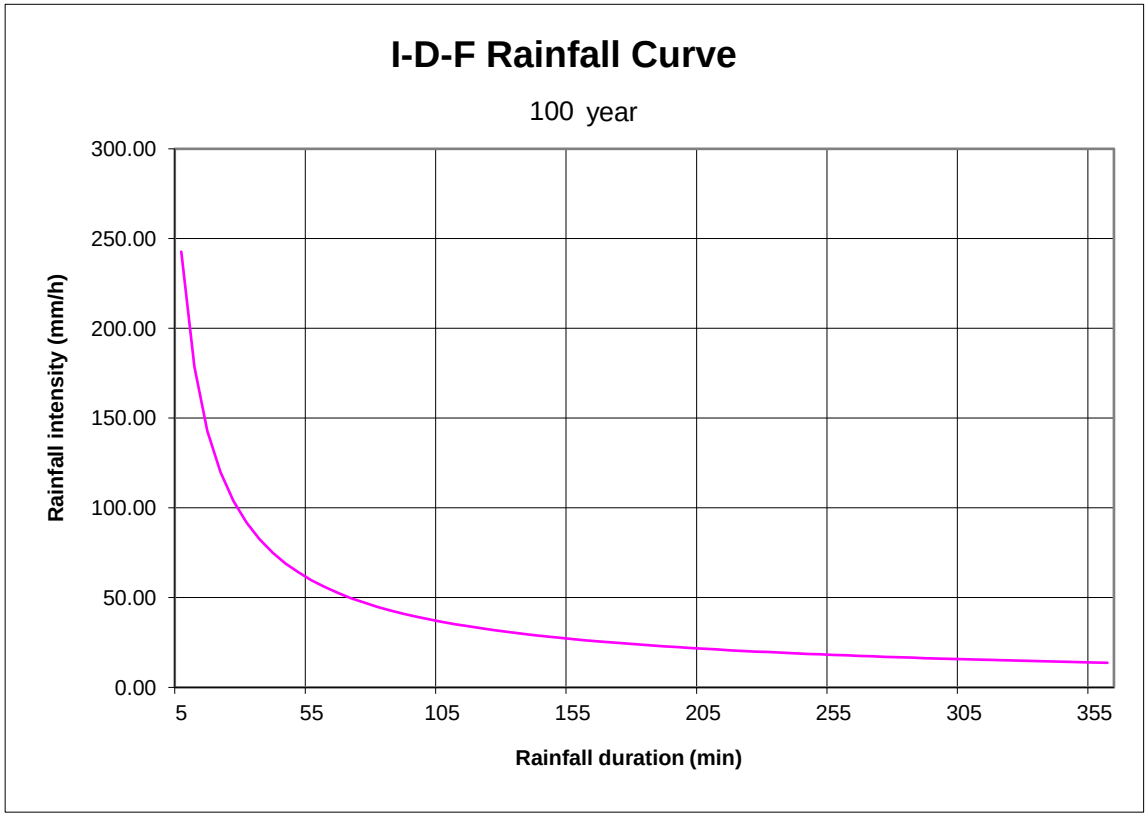
225.0	20.01	122.77	87.455214	35.31
230.0	19.66	123.31	89.3986632	33.91
235.0	19.33	123.84	91.3421124	32.50
240.0	19.01	124.37	93.2855616	31.08
245.0	18.69	124.88	95.2290108	29.65
250.0	18.39	125.38	97.17246	28.21
255.0	18.11	125.88	99.1159092	26.76
260.0	17.83	126.37	101.059358	25.31
265.0	17.56	126.84	103.002808	23.84
270.0	17.29	127.31	104.946257	22.37
275.0	17.04	127.78	106.889706	20.89
280.0	16.80	128.23	108.833155	19.40
285.0	16.56	128.68	110.776604	17.90
290.0	16.33	129.12	112.720054	16.40
295.0	16.11	129.56	114.663503	14.89
300.0	15.89	129.98	116.606952	13.38
305.0	15.68	130.41	118.550401	11.86
310.0	15.48	130.82	120.49385	10.33
315.0	15.28	131.23	122.4373	8.79
320.0	15.09	131.64	124.380749	7.25
325.0	14.90	132.03	126.324198	5.71
330.0	14.72	132.43	128.267647	4.16
335.0	14.54	132.82	130.211096	2.60
340.0	14.37	133.20	132.154546	1.04
345.0	14.20	133.58	134.097995	-0.52
350.0	14.04	133.95	136.041444	-2.09
355.0	13.88	134.32	137.984893	-3.67
360.0	13.72	134.68	139.928342	-5.25
Max Volume (V max):				68.12
Design Volume (V design) :				**68.12**

800 Palladium Dr.
Office Building

Sub-Area B

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 38 L/s/ha

Area : C 0.1371 ha
Runoff Coefficient C : 0.95
Rainfall Event : 100 year
Discharge Flow Q : 0.0052098 m³/s
Discharge Factor K : 1

Design Volume: **54.04 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

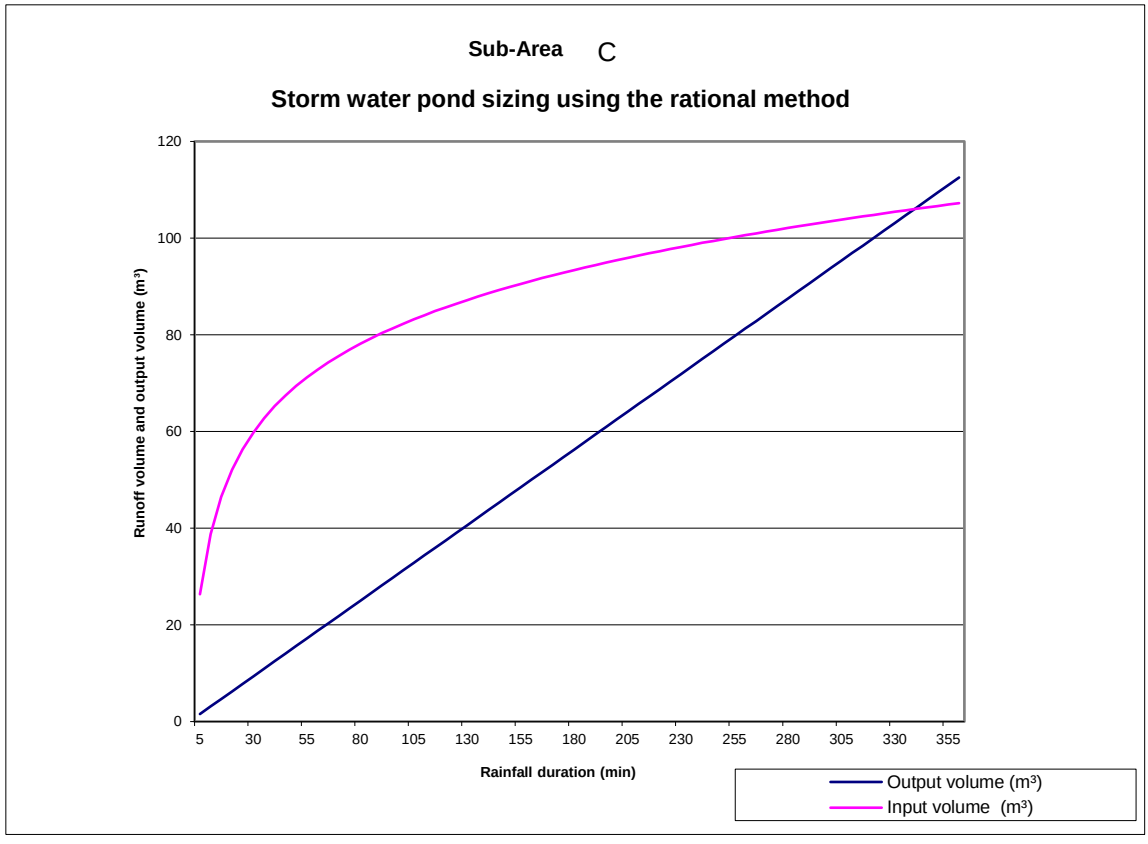
Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

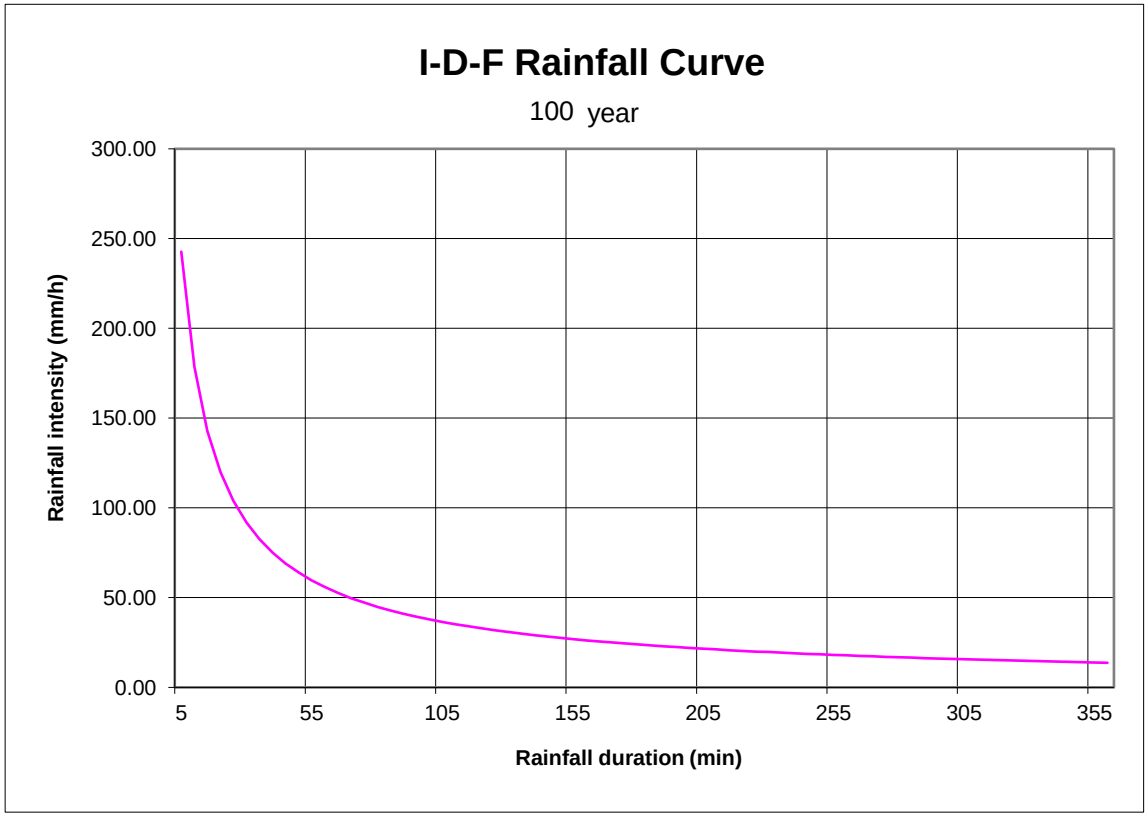
Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	26.34	1.56294	24.78
10.0	178.56	38.76	3.12588	35.63
15.0	142.89	46.53	4.68882	41.84
20.0	119.95	52.08	6.25176	45.82
25.0	103.85	56.36	7.8147	48.54
30.0	91.87	59.83	9.37764	50.45
35.0	82.58	62.74	10.94058	51.80
40.0	75.15	65.25	12.50352	52.75
45.0	69.05	67.45	14.06646	53.38
50.0	63.95	69.41	15.6294	53.78
55.0	59.62	71.19	17.19234	53.99
60.0	55.89	72.80	18.75528	54.04
65.0	52.65	74.28	20.31822	53.97
70.0	49.79	75.66	21.88116	53.78
75.0	47.26	76.93	23.4441	53.49
80.0	44.99	78.13	25.00704	53.12
85.0	42.95	79.26	26.56998	52.69
90.0	41.11	80.32	28.13292	52.18
95.0	39.43	81.32	29.69586	51.63
100.0	37.90	82.28	31.2588	51.02
105.0	36.50	83.19	32.82174	50.37
110.0	35.20	84.06	34.38468	49.67
115.0	34.01	84.89	35.94762	48.94
120.0	32.89	85.69	37.51056	48.18
125.0	31.86	86.46	39.0735	47.38
130.0	30.90	87.19	40.63644	46.56
135.0	30.00	87.91	42.19938	45.71
140.0	29.15	88.59	43.76232	44.83
145.0	28.36	89.26	45.32526	43.93
150.0	27.61	89.90	46.8882	43.02
155.0	26.91	90.53	48.45114	42.08
160.0	26.24	91.13	50.01408	41.12
165.0	25.61	91.72	51.57702	40.15
170.0	25.01	92.30	53.13996	39.16
175.0	24.44	92.85	54.7029	38.15
180.0	23.90	93.40	56.26584	37.13
185.0	23.39	93.92	57.82878	36.10
190.0	22.90	94.44	59.39172	35.05
195.0	22.43	94.94	60.95466	33.99
200.0	21.98	95.44	62.5176	32.92
205.0	21.55	95.92	64.08054	31.84
210.0	21.14	96.39	65.64348	30.75
215.0	20.75	96.85	67.20642	29.64
220.0	20.37	97.30	68.76936	28.53

225.0	20.01	97.74	70.3323	27.41
230.0	19.66	98.17	71.89524	26.28
235.0	19.33	98.60	73.45818	25.14
240.0	19.01	99.02	75.02112	23.99
245.0	18.69	99.42	76.58406	22.84
250.0	18.39	99.83	78.147	21.68
255.0	18.11	100.22	79.70994	20.51
260.0	17.83	100.61	81.27288	19.34
265.0	17.56	100.99	82.83582	18.15
270.0	17.29	101.36	84.39876	16.96
275.0	17.04	101.73	85.9617	15.77
280.0	16.80	102.09	87.52464	14.57
285.0	16.56	102.45	89.08758	13.36
290.0	16.33	102.80	90.65052	12.15
295.0	16.11	103.15	92.21346	10.93
300.0	15.89	103.49	93.7764	9.71
305.0	15.68	103.82	95.33934	8.49
310.0	15.48	104.16	96.90228	7.25
315.0	15.28	104.48	98.46522	6.02
320.0	15.09	104.80	100.02816	4.78
325.0	14.90	105.12	101.5911	3.53
330.0	14.72	105.43	103.15404	2.28
335.0	14.54	105.74	104.71698	1.03
340.0	14.37	106.05	106.27992	-0.23
345.0	14.20	106.35	107.84286	-1.49
350.0	14.04	106.65	109.4058	-2.76
355.0	13.88	106.94	110.96874	-4.03
360.0	13.72	107.23	112.53168	-5.30
Max Volume (V max):				54.04
Design Volume (V design) :				**54.04**

800 Palladium Dr.
Office Building





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 38 L/s/ha

Area : D 0.1153 ha
Runoff Coefficient C : 0.95
Rainfall Event : 100 year
Discharge Flow Q : 0.0043814 m³/s
Discharge Factor K : 1

Design Volume: **45.45 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

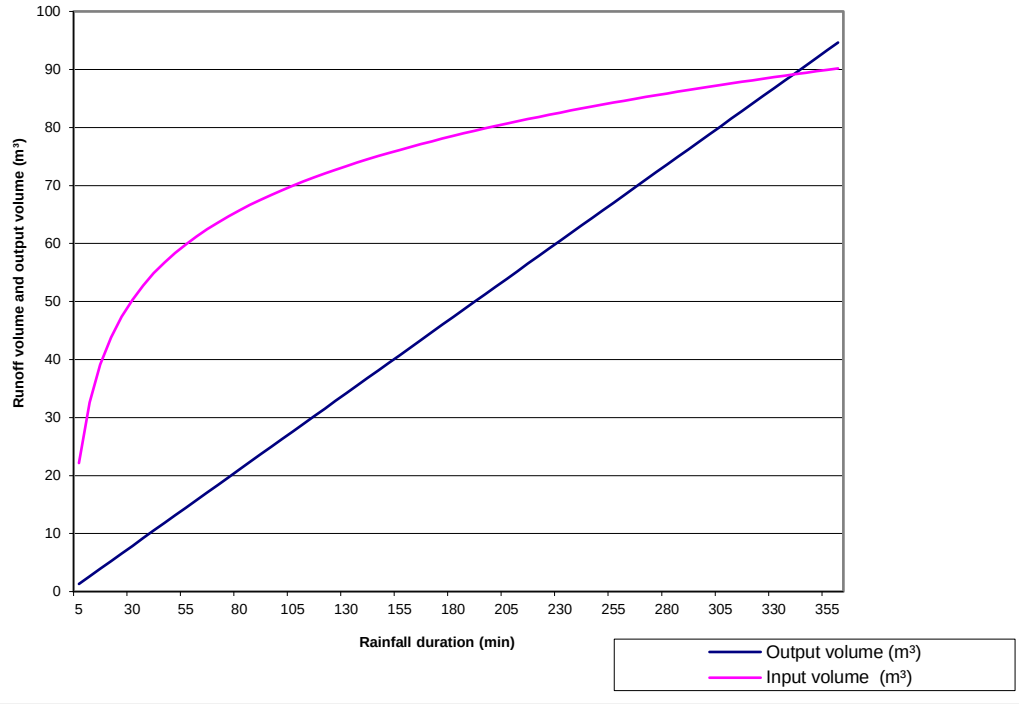
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	22.15	1.31442	20.84
10.0	178.56	32.60	2.62884	29.97
15.0	142.89	39.13	3.94326	35.19
20.0	119.95	43.80	5.25768	38.54
25.0	103.85	47.40	6.5721	40.82
30.0	91.87	50.31	7.88652	42.43
35.0	82.58	52.76	9.20094	43.56
40.0	75.15	54.87	10.51536	44.36
45.0	69.05	56.73	11.82978	44.90
50.0	63.95	58.38	13.1442	45.23
55.0	59.62	59.87	14.45862	45.41
60.0	55.89	61.22	15.77304	45.45
65.0	52.65	62.47	17.08746	45.38
70.0	49.79	63.63	18.40188	45.22
75.0	47.26	64.70	19.7163	44.99
80.0	44.99	65.71	21.03072	44.68
85.0	42.95	66.65	22.34514	44.31
90.0	41.11	67.55	23.65956	43.89
95.0	39.43	68.39	24.97398	43.42
100.0	37.90	69.20	26.2884	42.91
105.0	36.50	69.96	27.60282	42.36
110.0	35.20	70.69	28.91724	41.77
115.0	34.01	71.39	30.23166	41.16
120.0	32.89	72.06	31.54608	40.52
125.0	31.86	72.71	32.8605	39.85
130.0	30.90	73.33	34.17492	39.15
135.0	30.00	73.93	35.48934	38.44
140.0	29.15	74.51	36.80376	37.70
145.0	28.36	75.07	38.11818	36.95
150.0	27.61	75.61	39.4326	36.18
155.0	26.91	76.13	40.74702	35.39
160.0	26.24	76.64	42.06144	34.58
165.0	25.61	77.14	43.37586	33.76
170.0	25.01	77.62	44.69028	32.93
175.0	24.44	78.09	46.0047	32.08
180.0	23.90	78.54	47.31912	31.23
185.0	23.39	78.99	48.63354	30.36
190.0	22.90	79.42	49.94796	29.48
195.0	22.43	79.85	51.26238	28.59
200.0	21.98	80.26	52.5768	27.68
205.0	21.55	80.67	53.89122	26.78
210.0	21.14	81.06	55.20564	25.86
215.0	20.75	81.45	56.52006	24.93
220.0	20.37	81.83	57.83448	23.99

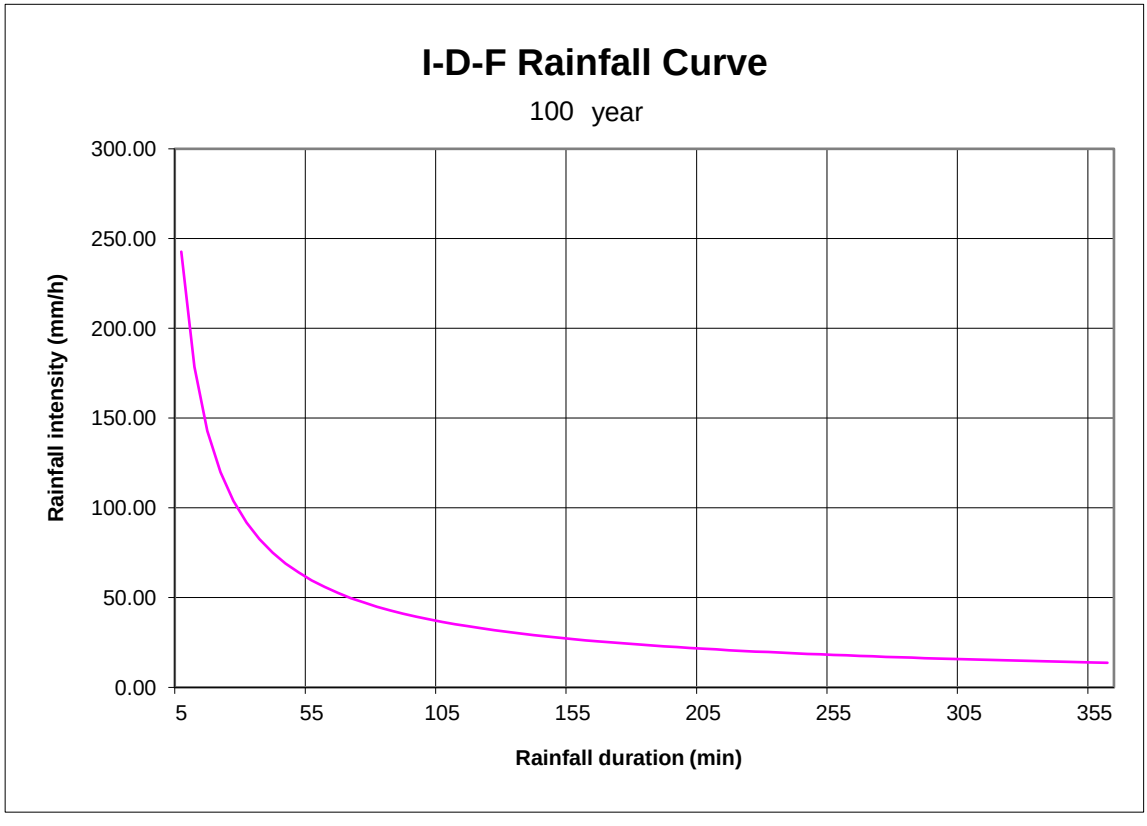
225.0	20.01	82.20	59.1489	23.05
230.0	19.66	82.56	60.46332	22.10
235.0	19.33	82.92	61.77774	21.14
240.0	19.01	83.27	63.09216	20.18
245.0	18.69	83.62	64.40658	19.21
250.0	18.39	83.95	65.721	18.23
255.0	18.11	84.28	67.03542	17.25
260.0	17.83	84.61	68.34984	16.26
265.0	17.56	84.93	69.66426	15.27
270.0	17.29	85.25	70.97868	14.27
275.0	17.04	85.56	72.2931	13.26
280.0	16.80	85.86	73.60752	12.25
285.0	16.56	86.16	74.92194	11.24
290.0	16.33	86.46	76.23636	10.22
295.0	16.11	86.75	77.55078	9.20
300.0	15.89	87.03	78.8652	8.17
305.0	15.68	87.32	80.17962	7.14
310.0	15.48	87.59	81.49404	6.10
315.0	15.28	87.87	82.80846	5.06
320.0	15.09	88.14	84.12288	4.02
325.0	14.90	88.41	85.4373	2.97
330.0	14.72	88.67	86.75172	1.92
335.0	14.54	88.93	88.06614	0.86
340.0	14.37	89.19	89.38056	-0.19
345.0	14.20	89.44	90.69498	-1.26
350.0	14.04	89.69	92.0094	-2.32
355.0	13.88	89.94	93.32382	-3.39
360.0	13.72	90.18	94.63824	-4.46
Max Volume (V max):				45.45
Design Volume (V design) :				**45.45**

800 Palladium Dr.
Office Building

Sub-Area D

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 38 L/s/ha

Area : E 0.1469 ha
Runoff Coefficient C : 0.95
Rainfall Event : 100 year
Discharge Flow Q : 0.0055822 m³/s
Discharge Factor K : 1

Design Volume: **57.91 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

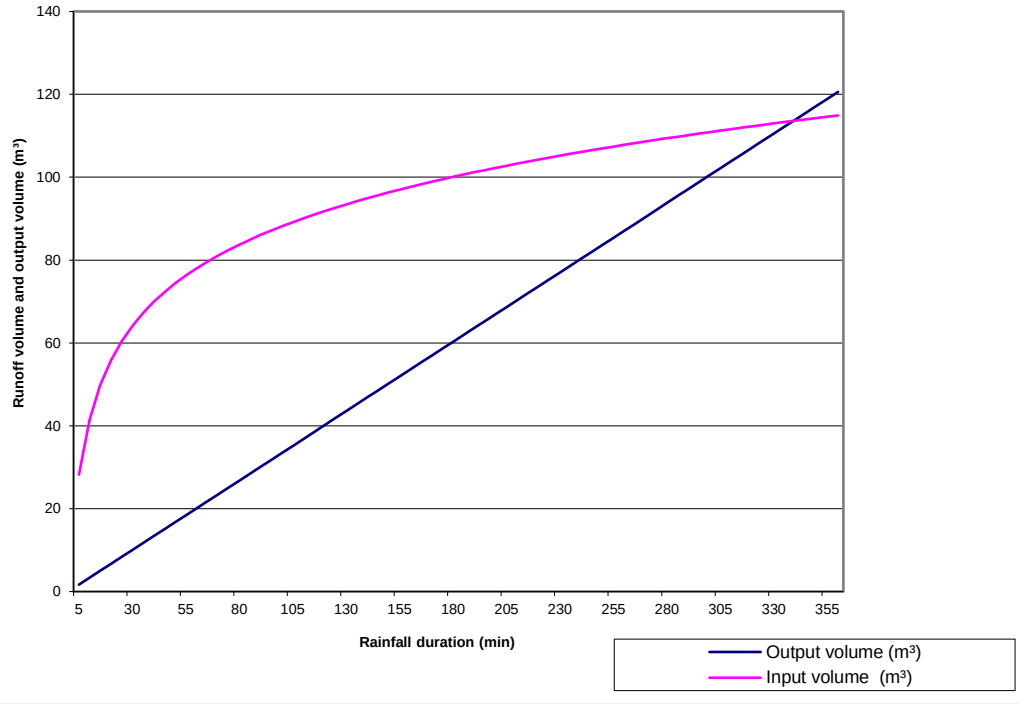
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	28.23	1.67466	26.55
10.0	178.56	41.53	3.34932	38.18
15.0	142.89	49.85	5.02398	44.83
20.0	119.95	55.80	6.69864	49.10
25.0	103.85	60.38	8.3733	52.01
30.0	91.87	64.10	10.04796	54.06
35.0	82.58	67.22	11.72262	55.50
40.0	75.15	69.91	13.39728	56.52
45.0	69.05	72.27	15.07194	57.20
50.0	63.95	74.38	16.7466	57.63
55.0	59.62	76.27	18.42126	57.85
60.0	55.89	78.00	20.09592	57.91
65.0	52.65	79.59	21.77058	57.82
70.0	49.79	81.06	23.44524	57.62
75.0	47.26	82.43	25.1199	57.31
80.0	44.99	83.72	26.79456	56.92
85.0	42.95	84.92	28.46922	56.45
90.0	41.11	86.06	30.14388	55.91
95.0	39.43	87.14	31.81854	55.32
100.0	37.90	88.16	33.4932	54.67
105.0	36.50	89.13	35.16786	53.97
110.0	35.20	90.07	36.84252	53.22
115.0	34.01	90.96	38.51718	52.44
120.0	32.89	91.81	40.19184	51.62
125.0	31.86	92.64	41.8665	50.77
130.0	30.90	93.43	43.54116	49.89
135.0	30.00	94.19	45.21582	48.97
140.0	29.15	94.93	46.89048	48.04
145.0	28.36	95.64	48.56514	47.07
150.0	27.61	96.33	50.2398	46.09
155.0	26.91	97.00	51.91446	45.09
160.0	26.24	97.65	53.58912	44.06
165.0	25.61	98.28	55.26378	43.02
170.0	25.01	98.89	56.93844	41.95
175.0	24.44	99.49	58.6131	40.88
180.0	23.90	100.07	60.28776	39.78
185.0	23.39	100.64	61.96242	38.68
190.0	22.90	101.19	63.63708	37.55
195.0	22.43	101.73	65.31174	36.42
200.0	21.98	102.26	66.9864	35.27
205.0	21.55	102.77	68.66106	34.11
210.0	21.14	103.28	70.33572	32.94
215.0	20.75	103.77	72.01038	31.76
220.0	20.37	104.26	73.68504	30.57

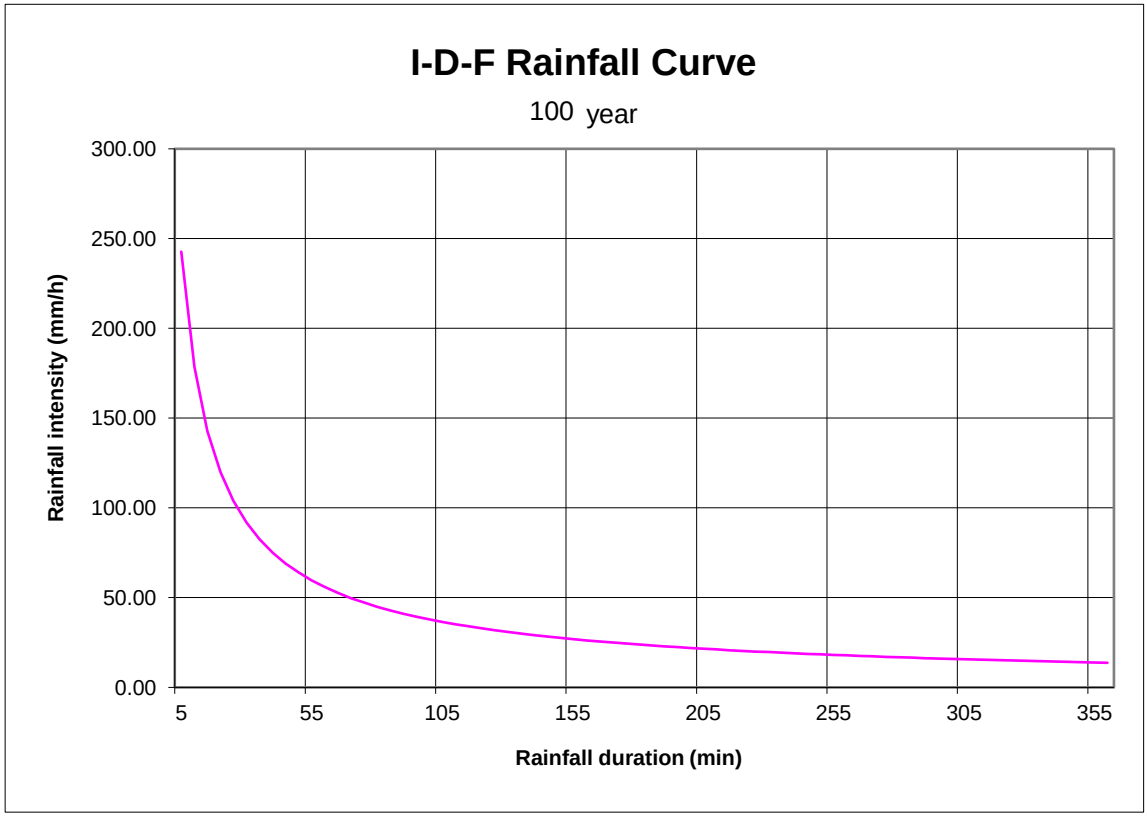
225.0	20.01	104.73	75.3597	29.37
230.0	19.66	105.19	77.03436	28.16
235.0	19.33	105.65	78.70902	26.94
240.0	19.01	106.09	80.38368	25.71
245.0	18.69	106.53	82.05834	24.47
250.0	18.39	106.96	83.733	23.23
255.0	18.11	107.38	85.40766	21.98
260.0	17.83	107.80	87.08232	20.72
265.0	17.56	108.21	88.75698	19.45
270.0	17.29	108.61	90.43164	18.18
275.0	17.04	109.00	92.1063	16.90
280.0	16.80	109.39	93.78096	15.61
285.0	16.56	109.77	95.45562	14.32
290.0	16.33	110.15	97.13028	13.02
295.0	16.11	110.52	98.80494	11.72
300.0	15.89	110.89	100.4796	10.41
305.0	15.68	111.25	102.15426	9.09
310.0	15.48	111.60	103.82892	7.77
315.0	15.28	111.95	105.50358	6.45
320.0	15.09	112.30	107.17824	5.12
325.0	14.90	112.64	108.8529	3.78
330.0	14.72	112.97	110.52756	2.44
335.0	14.54	113.30	112.20222	1.10
340.0	14.37	113.63	113.87688	-0.25
345.0	14.20	113.95	115.55154	-1.60
350.0	14.04	114.27	117.2262	-2.96
355.0	13.88	114.58	118.90086	-4.32
360.0	13.72	114.89	120.57552	-5.68
Max Volume (V max):				57.91
Design Volume (V design) :				**57.91**

800 Palladium Dr.
Office Building

Sub-Area E

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 38 L/s/ha

Area : F 0.1357 ha
Runoff Coefficient C : 0.95
Rainfall Event : 100 year
Discharge Flow Q : 0.0051566 m³/s
Discharge Factor K : 1

Design Volume: **53.49 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

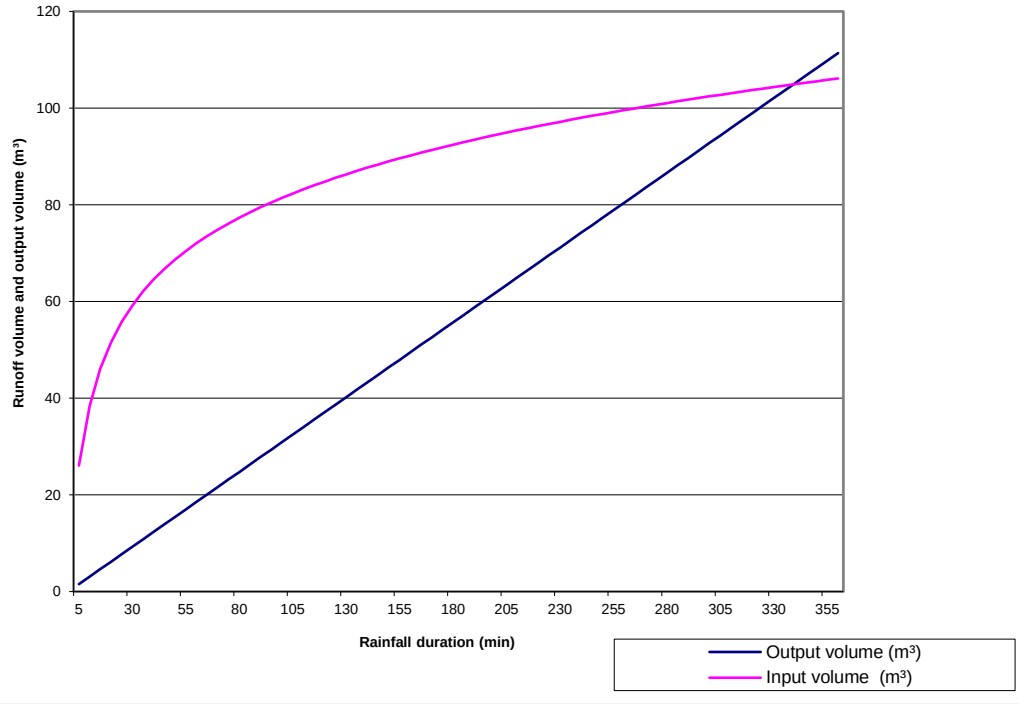
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	26.07	1.54698	24.53
10.0	178.56	38.36	3.09396	35.27
15.0	142.89	46.05	4.64094	41.41
20.0	119.95	51.54	6.18792	45.36
25.0	103.85	55.78	7.7349	48.05
30.0	91.87	59.22	9.28188	49.93
35.0	82.58	62.10	10.82886	51.27
40.0	75.15	64.58	12.37584	52.21
45.0	69.05	66.76	13.92282	52.84
50.0	63.95	68.71	15.4698	53.24
55.0	59.62	70.46	17.01678	53.44
60.0	55.89	72.06	18.56376	53.49
65.0	52.65	73.53	20.11074	53.41
70.0	49.79	74.88	21.65772	53.23
75.0	47.26	76.15	23.2047	52.94
80.0	44.99	77.33	24.75168	52.58
85.0	42.95	78.45	26.29866	52.15
90.0	41.11	79.50	27.84564	51.65
95.0	39.43	80.49	29.39262	51.10
100.0	37.90	81.44	30.9396	50.50
105.0	36.50	82.34	32.48658	49.85
110.0	35.20	83.20	34.03356	49.17
115.0	34.01	84.02	35.58054	48.44
120.0	32.89	84.81	37.12752	47.69
125.0	31.86	85.57	38.6745	46.90
130.0	30.90	86.30	40.22148	46.08
135.0	30.00	87.01	41.76846	45.24
140.0	29.15	87.69	43.31544	44.37
145.0	28.36	88.35	44.86242	43.49
150.0	27.61	88.99	46.4094	42.58
155.0	26.91	89.60	47.95638	41.65
160.0	26.24	90.20	49.50336	40.70
165.0	25.61	90.79	51.05034	39.74
170.0	25.01	91.35	52.59732	38.76
175.0	24.44	91.90	54.1443	37.76
180.0	23.90	92.44	55.69128	36.75
185.0	23.39	92.97	57.23826	35.73
190.0	22.90	93.48	58.78524	34.69
195.0	22.43	93.98	60.33222	33.64
200.0	21.98	94.46	61.8792	32.58
205.0	21.55	94.94	63.42618	31.51
210.0	21.14	95.40	64.97316	30.43
215.0	20.75	95.86	66.52014	29.34
220.0	20.37	96.31	68.06712	28.24

225.0	20.01	96.74	69.6141	27.13
230.0	19.66	97.17	71.16108	26.01
235.0	19.33	97.59	72.70806	24.88
240.0	19.01	98.00	74.25504	23.75
245.0	18.69	98.41	75.80202	22.61
250.0	18.39	98.81	77.349	21.46
255.0	18.11	99.20	78.89598	20.30
260.0	17.83	99.58	80.44296	19.14
265.0	17.56	99.96	81.98994	17.97
270.0	17.29	100.33	83.53692	16.79
275.0	17.04	100.69	85.0839	15.61
280.0	16.80	101.05	86.63088	14.42
285.0	16.56	101.40	88.17786	13.23
290.0	16.33	101.75	89.72484	12.03
295.0	16.11	102.10	91.27182	10.82
300.0	15.89	102.43	92.8188	9.61
305.0	15.68	102.76	94.36578	8.40
310.0	15.48	103.09	95.91276	7.18
315.0	15.28	103.42	97.45974	5.96
320.0	15.09	103.73	99.00672	4.73
325.0	14.90	104.05	100.5537	3.49
330.0	14.72	104.36	102.10068	2.26
335.0	14.54	104.66	103.64766	1.02
340.0	14.37	104.97	105.19464	-0.23
345.0	14.20	105.26	106.74162	-1.48
350.0	14.04	105.56	108.2886	-2.73
355.0	13.88	105.85	109.83558	-3.99
360.0	13.72	106.13	111.38256	-5.25
Max Volume (V max):				53.49
Design Volume (V design) :				**53.49**

800 Palladium Dr.
Office Building

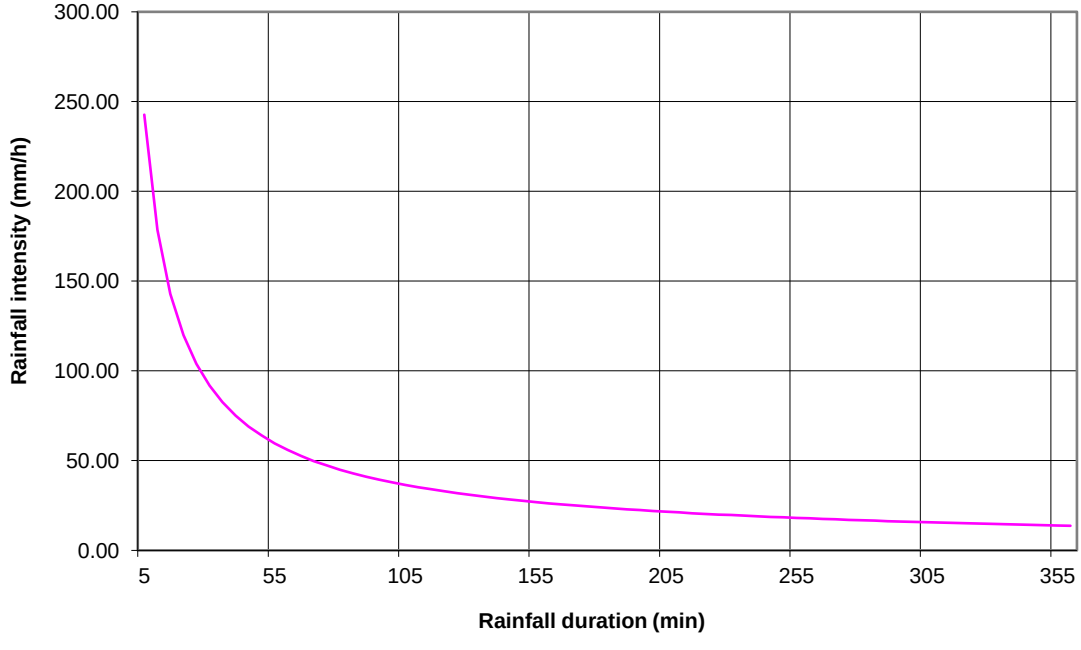
Sub-Area F

Storm water pond sizing using the rational method



I-D-F Rainfall Curve

100 year



STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area : G 0.0326 ha
Runoff Coefficient C : 0.49
Rainfall Event : 100 year
Discharge Flow Q : 0.000978 m³/s
Discharge Factor K : 1

Design Volume: **5.66 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

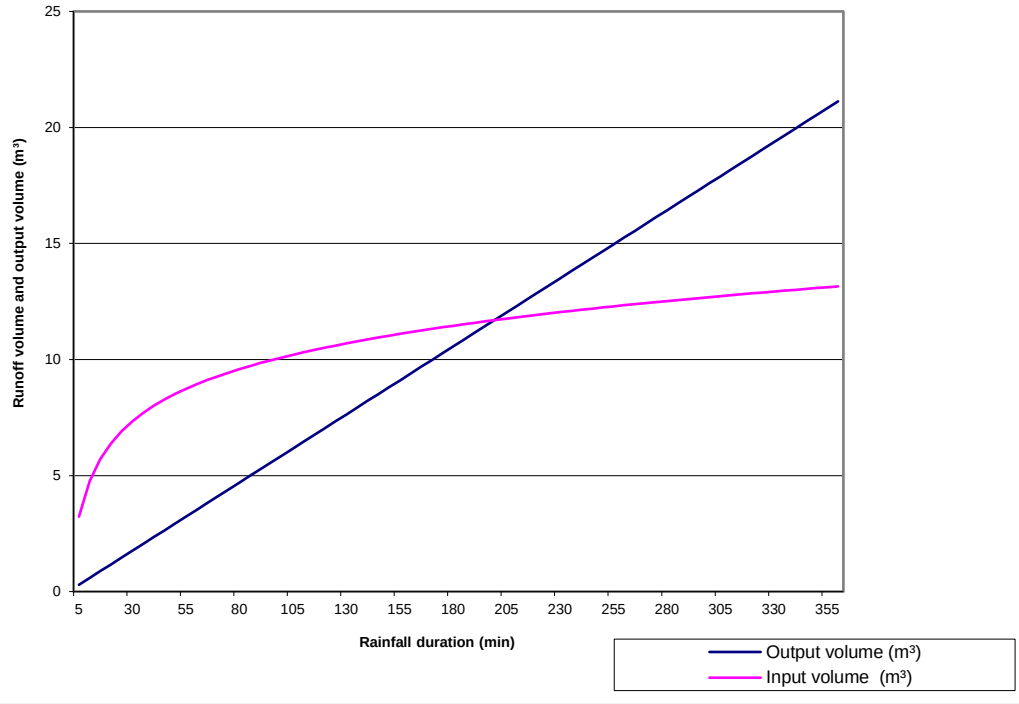
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	3.23	0.2934	2.94
10.0	178.56	4.75	0.5868	4.17
15.0	142.89	5.71	0.8802	4.83
20.0	119.95	6.39	1.1736	5.21
25.0	103.85	6.91	1.467	5.44
30.0	91.87	7.34	1.7604	5.58
35.0	82.58	7.69	2.0538	5.64
40.0	75.15	8.00	2.3472	5.66
45.0	69.05	8.27	2.6406	5.63
50.0	63.95	8.51	2.934	5.58
55.0	59.62	8.73	3.2274	5.50
60.0	55.89	8.93	3.5208	5.41
65.0	52.65	9.11	3.8142	5.30
70.0	49.79	9.28	4.1076	5.17
75.0	47.26	9.44	4.401	5.03
80.0	44.99	9.58	4.6944	4.89
85.0	42.95	9.72	4.9878	4.73
90.0	41.11	9.85	5.2812	4.57
95.0	39.43	9.97	5.5746	4.40
100.0	37.90	10.09	5.868	4.22
105.0	36.50	10.20	6.1614	4.04
110.0	35.20	10.31	6.4548	3.85
115.0	34.01	10.41	6.7482	3.66
120.0	32.89	10.51	7.0416	3.47
125.0	31.86	10.60	7.335	3.27
130.0	30.90	10.69	7.6284	3.07
135.0	30.00	10.78	7.9218	2.86
140.0	29.15	10.87	8.2152	2.65
145.0	28.36	10.95	8.5086	2.44
150.0	27.61	11.03	8.802	2.22
155.0	26.91	11.10	9.0954	2.01
160.0	26.24	11.18	9.3888	1.79
165.0	25.61	11.25	9.6822	1.57
170.0	25.01	11.32	9.9756	1.34
175.0	24.44	11.39	10.269	1.12
180.0	23.90	11.45	10.5624	0.89
185.0	23.39	11.52	10.8558	0.66
190.0	22.90	11.58	11.1492	0.43
195.0	22.43	11.64	11.4426	0.20
200.0	21.98	11.70	11.736	-0.03
205.0	21.55	11.76	12.0294	-0.27
210.0	21.14	11.82	12.3228	-0.50
215.0	20.75	11.88	12.6162	-0.74
220.0	20.37	11.93	12.9096	-0.98

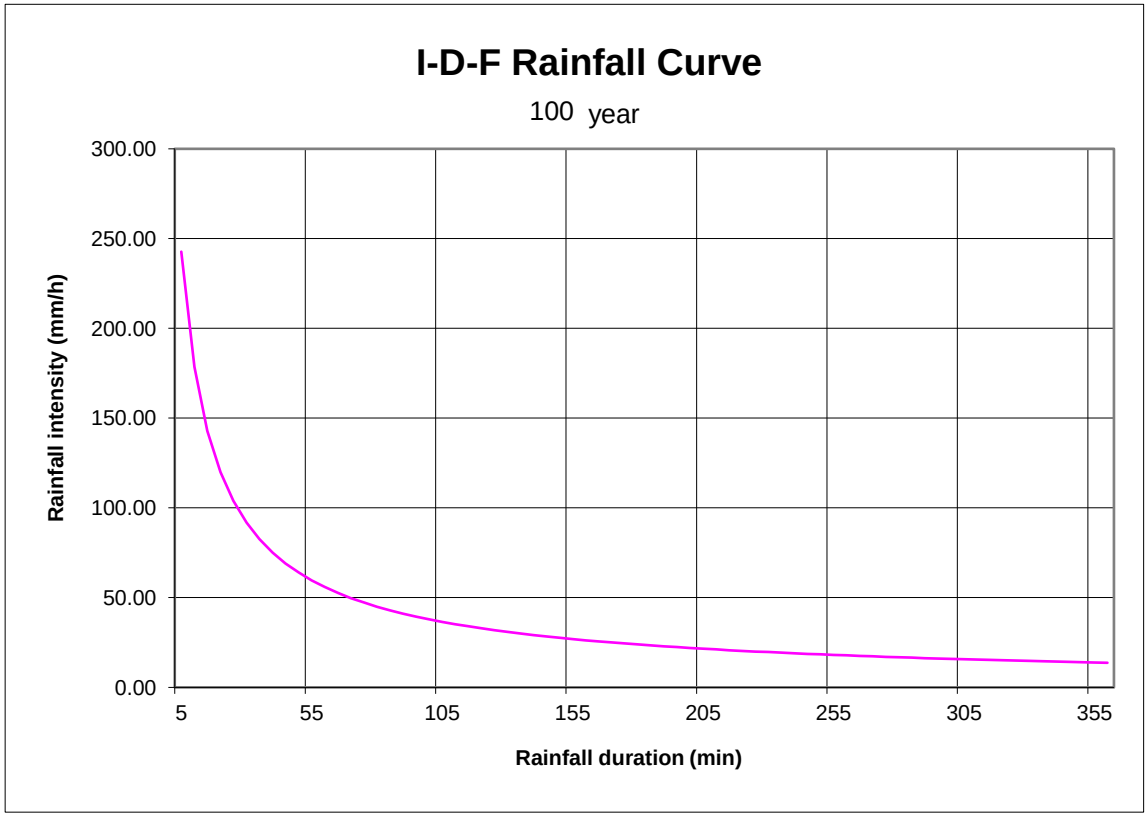
225.0	20.01	11.99	13.203	-1.22
230.0	19.66	12.04	13.4964	-1.46
235.0	19.33	12.09	13.7898	-1.70
240.0	19.01	12.14	14.0832	-1.94
245.0	18.69	12.19	14.3766	-2.18
250.0	18.39	12.24	14.67	-2.43
255.0	18.11	12.29	14.9634	-2.67
260.0	17.83	12.34	15.2568	-2.92
265.0	17.56	12.39	15.5502	-3.16
270.0	17.29	12.43	15.8436	-3.41
275.0	17.04	12.48	16.137	-3.66
280.0	16.80	12.52	16.4304	-3.91
285.0	16.56	12.57	16.7238	-4.16
290.0	16.33	12.61	17.0172	-4.41
295.0	16.11	12.65	17.3106	-4.66
300.0	15.89	12.69	17.604	-4.91
305.0	15.68	12.73	17.8974	-5.16
310.0	15.48	12.77	18.1908	-5.42
315.0	15.28	12.81	18.4842	-5.67
320.0	15.09	12.85	18.7776	-5.92
325.0	14.90	12.89	19.071	-6.18
330.0	14.72	12.93	19.3644	-6.43
335.0	14.54	12.97	19.6578	-6.69
340.0	14.37	13.01	19.9512	-6.94
345.0	14.20	13.04	20.2446	-7.20
350.0	14.04	13.08	20.538	-7.46
355.0	13.88	13.12	20.8314	-7.72
360.0	13.72	13.15	21.1248	-7.97
Max Volume (V max):				5.66
Design Volume (V design) :				**5.66**

800 Palladium Dr.
Office Building

Sub-Area G

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area : H 0.0059 ha
Runoff Coefficient C : 0.55
Rainfall Event : 100 year
Discharge Flow Q : 0.000177 m³/s
Discharge Factor K : 1

Design Volume: **1.20 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

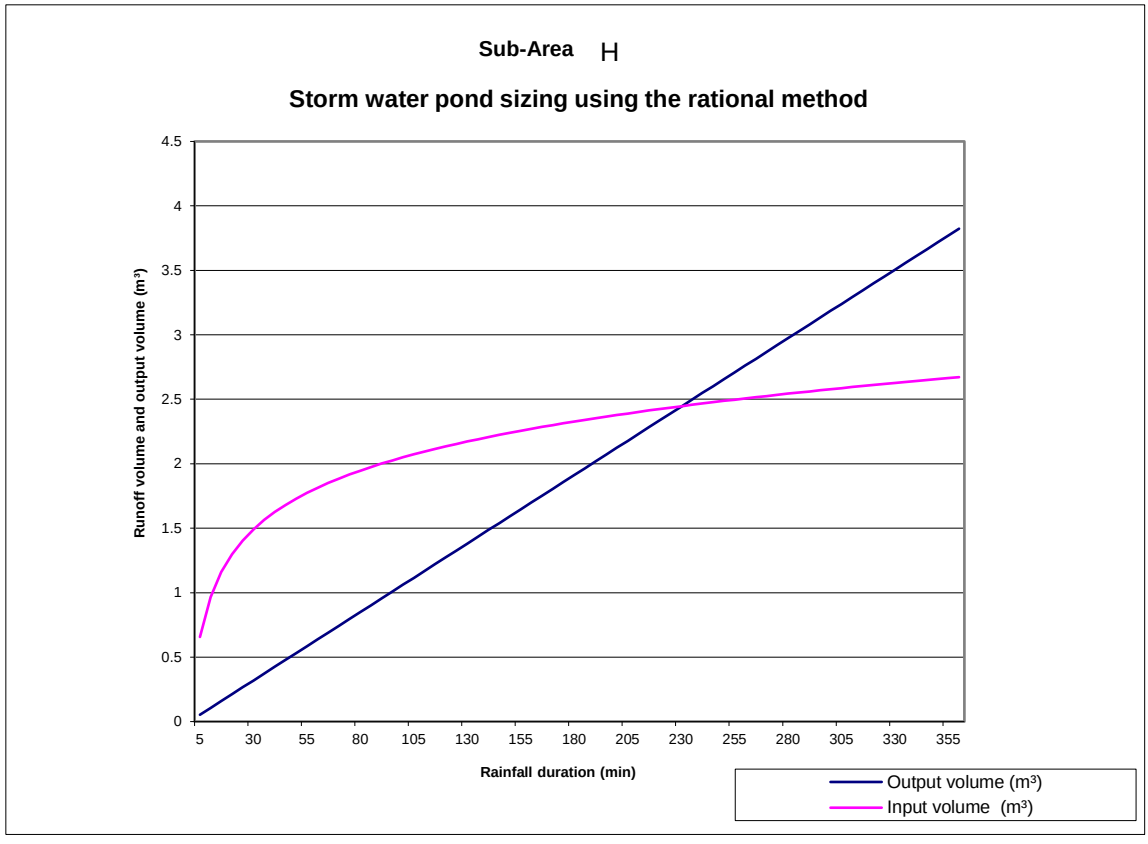
Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

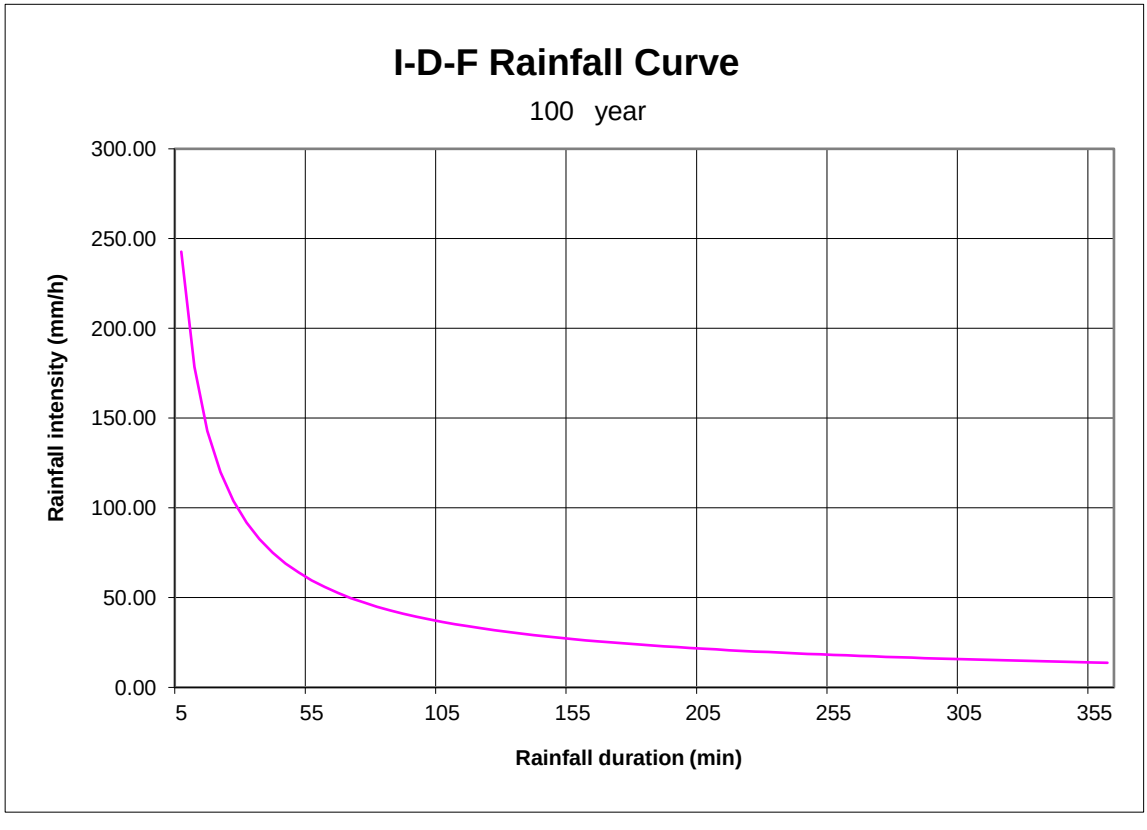
Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	0.66	0.0531	0.60
10.0	178.56	0.97	0.1062	0.86
15.0	142.89	1.16	0.1593	1.00
20.0	119.95	1.30	0.2124	1.09
25.0	103.85	1.40	0.2655	1.14
30.0	91.87	1.49	0.3186	1.17
35.0	82.58	1.56	0.3717	1.19
40.0	75.15	1.63	0.4248	1.20
45.0	69.05	1.68	0.4779	1.20
50.0	63.95	1.73	0.531	1.20
55.0	59.62	1.77	0.5841	1.19
60.0	55.89	1.81	0.6372	1.18
65.0	52.65	1.85	0.6903	1.16
70.0	49.79	1.88	0.7434	1.14
75.0	47.26	1.92	0.7965	1.12
80.0	44.99	1.95	0.8496	1.10
85.0	42.95	1.97	0.9027	1.07
90.0	41.11	2.00	0.9558	1.05
95.0	39.43	2.03	1.0089	1.02
100.0	37.90	2.05	1.062	0.99
105.0	36.50	2.07	1.1151	0.96
110.0	35.20	2.09	1.1682	0.93
115.0	34.01	2.11	1.2213	0.89
120.0	32.89	2.13	1.2744	0.86
125.0	31.86	2.15	1.3275	0.83
130.0	30.90	2.17	1.3806	0.79
135.0	30.00	2.19	1.4337	0.76
140.0	29.15	2.21	1.4868	0.72
145.0	28.36	2.22	1.5399	0.68
150.0	27.61	2.24	1.593	0.65
155.0	26.91	2.26	1.6461	0.61
160.0	26.24	2.27	1.6992	0.57
165.0	25.61	2.29	1.7523	0.53
170.0	25.01	2.30	1.8054	0.49
175.0	24.44	2.31	1.8585	0.45
180.0	23.90	2.33	1.9116	0.42
185.0	23.39	2.34	1.9647	0.38
190.0	22.90	2.35	2.0178	0.34
195.0	22.43	2.37	2.0709	0.29
200.0	21.98	2.38	2.124	0.25
205.0	21.55	2.39	2.1771	0.21
210.0	21.14	2.40	2.2302	0.17
215.0	20.75	2.41	2.2833	0.13
220.0	20.37	2.42	2.3364	0.09

225.0	20.01	2.44	2.3895	0.05
230.0	19.66	2.45	2.4426	0.00
235.0	19.33	2.46	2.4957	-0.04
240.0	19.01	2.47	2.5488	-0.08
245.0	18.69	2.48	2.6019	-0.12
250.0	18.39	2.49	2.655	-0.17
255.0	18.11	2.50	2.7081	-0.21
260.0	17.83	2.51	2.7612	-0.25
265.0	17.56	2.52	2.8143	-0.30
270.0	17.29	2.53	2.8674	-0.34
275.0	17.04	2.53	2.9205	-0.39
280.0	16.80	2.54	2.9736	-0.43
285.0	16.56	2.55	3.0267	-0.47
290.0	16.33	2.56	3.0798	-0.52
295.0	16.11	2.57	3.1329	-0.56
300.0	15.89	2.58	3.186	-0.61
305.0	15.68	2.59	3.2391	-0.65
310.0	15.48	2.60	3.2922	-0.70
315.0	15.28	2.60	3.3453	-0.74
320.0	15.09	2.61	3.3984	-0.79
325.0	14.90	2.62	3.4515	-0.83
330.0	14.72	2.63	3.5046	-0.88
335.0	14.54	2.63	3.5577	-0.92
340.0	14.37	2.64	3.6108	-0.97
345.0	14.20	2.65	3.6639	-1.01
350.0	14.04	2.66	3.717	-1.06
355.0	13.88	2.66	3.7701	-1.11
360.0	13.72	2.67	3.8232	-1.15
Max Volume (V max):				1.20
Design Volume (V design) :				**1.20**

800 Palladium Dr.
Office Building





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area : 0.0116 ha
Runoff Coefficient C : 0.25
Rainfall Event : 100 year
Discharge Flow Q : 0.000348 m³/s
Discharge Factor K : 1

Design Volume: **0.74 m³**

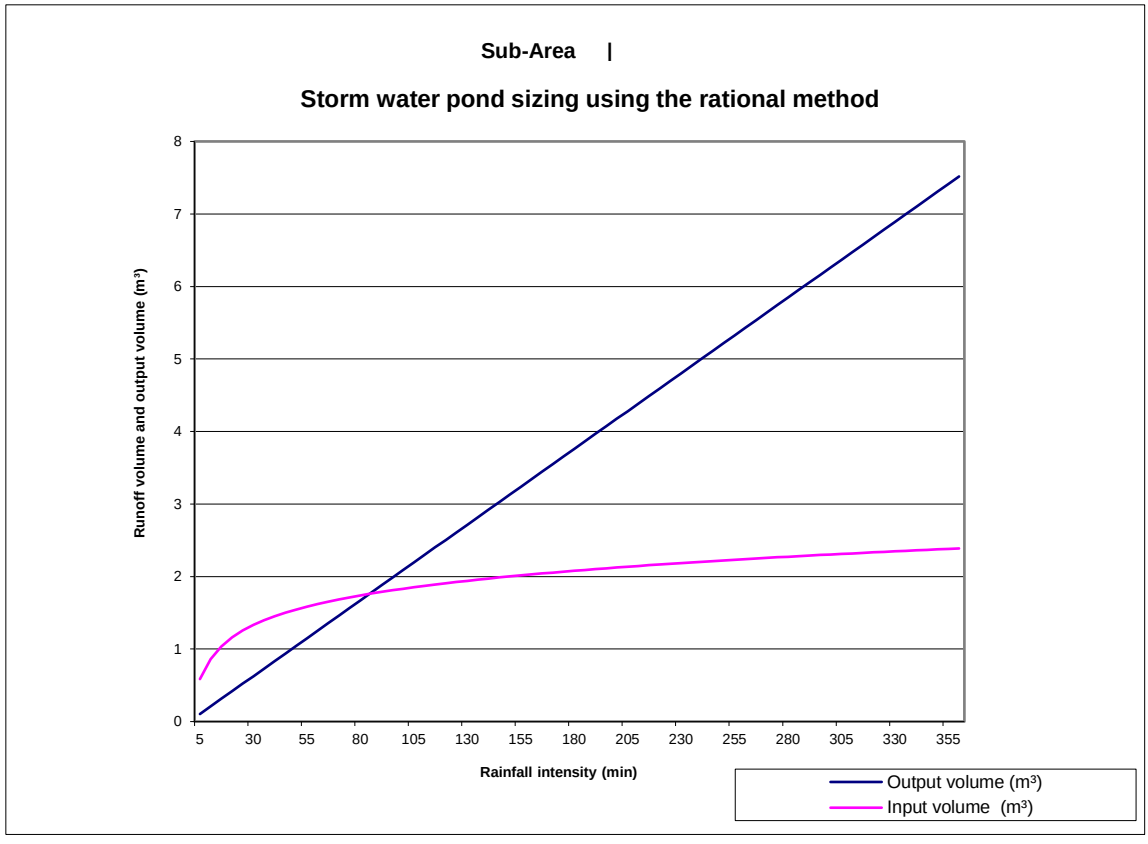
Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

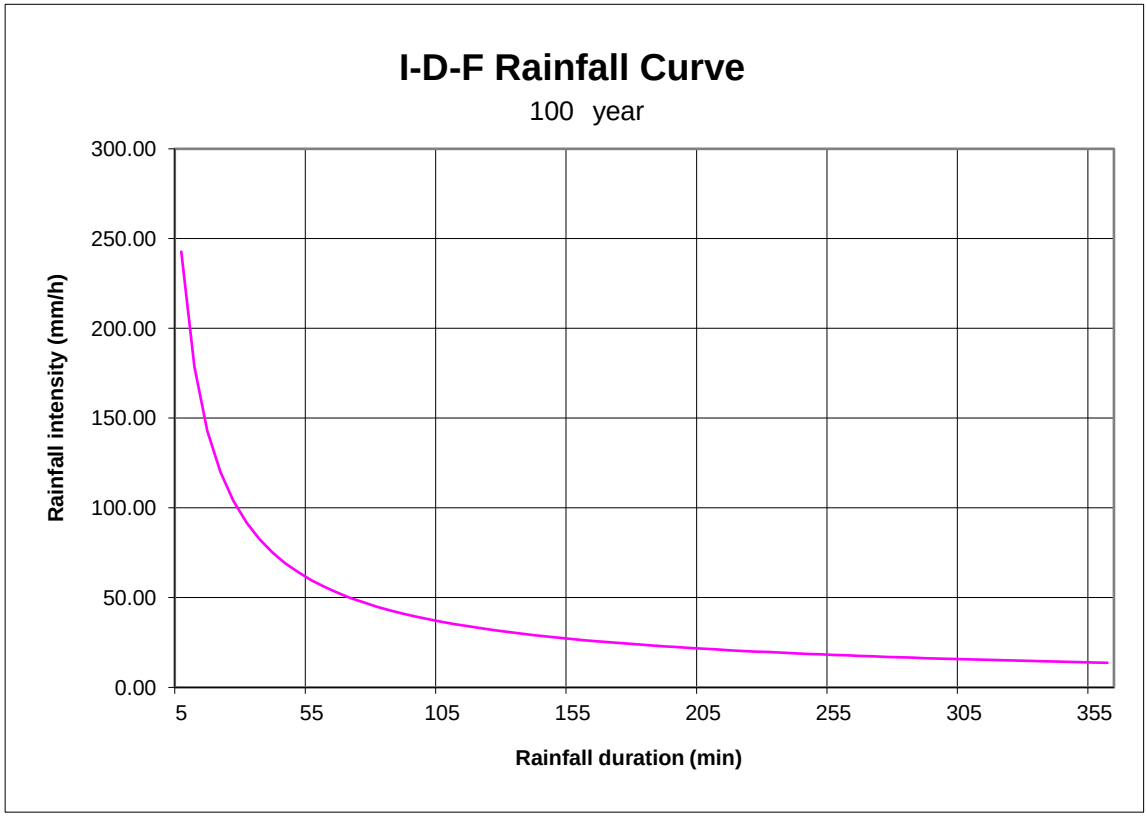
Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	0.59	0.1044	0.48
10.0	178.56	0.86	0.2088	0.65
15.0	142.89	1.04	0.3132	0.72
20.0	119.95	1.16	0.4176	0.74
25.0	103.85	1.25	0.522	0.73
30.0	91.87	1.33	0.6264	0.71
35.0	82.58	1.40	0.7308	0.67
40.0	75.15	1.45	0.8352	0.62
45.0	69.05	1.50	0.9396	0.56
50.0	63.95	1.55	1.044	0.50
55.0	59.62	1.58	1.1484	0.44
60.0	55.89	1.62	1.2528	0.37
65.0	52.65	1.65	1.3572	0.30
70.0	49.79	1.68	1.4616	0.22
75.0	47.26	1.71	1.566	0.15
80.0	44.99	1.74	1.6704	0.07
85.0	42.95	1.76	1.7748	-0.01
90.0	41.11	1.79	1.8792	-0.09
95.0	39.43	1.81	1.9836	-0.17
100.0	37.90	1.83	2.088	-0.26
105.0	36.50	1.85	2.1924	-0.34
110.0	35.20	1.87	2.2968	-0.43
115.0	34.01	1.89	2.4012	-0.51
120.0	32.89	1.91	2.5056	-0.60
125.0	31.86	1.92	2.61	-0.69
130.0	30.90	1.94	2.7144	-0.77
135.0	30.00	1.96	2.8188	-0.86
140.0	29.15	1.97	2.9232	-0.95
145.0	28.36	1.99	3.0276	-1.04
150.0	27.61	2.00	3.132	-1.13
155.0	26.91	2.02	3.2364	-1.22
160.0	26.24	2.03	3.3408	-1.31
165.0	25.61	2.04	3.4452	-1.40
170.0	25.01	2.06	3.5496	-1.49
175.0	24.44	2.07	3.654	-1.59
180.0	23.90	2.08	3.7584	-1.68
185.0	23.39	2.09	3.8628	-1.77
190.0	22.90	2.10	3.9672	-1.86
195.0	22.43	2.11	4.0716	-1.96
200.0	21.98	2.12	4.176	-2.05
205.0	21.55	2.14	4.2804	-2.14
210.0	21.14	2.15	4.3848	-2.24
215.0	20.75	2.16	4.4892	-2.33
220.0	20.37	2.17	4.5936	-2.43

225.0	20.01	2.18	4.698	-2.52
230.0	19.66	2.19	4.8024	-2.62
235.0	19.33	2.20	4.9068	-2.71
240.0	19.01	2.20	5.0112	-2.81
245.0	18.69	2.21	5.1156	-2.90
250.0	18.39	2.22	5.22	-3.00
255.0	18.11	2.23	5.3244	-3.09
260.0	17.83	2.24	5.4288	-3.19
265.0	17.56	2.25	5.5332	-3.28
270.0	17.29	2.26	5.6376	-3.38
275.0	17.04	2.27	5.742	-3.48
280.0	16.80	2.27	5.8464	-3.57
285.0	16.56	2.28	5.9508	-3.67
290.0	16.33	2.29	6.0552	-3.77
295.0	16.11	2.30	6.1596	-3.86
300.0	15.89	2.30	6.264	-3.96
305.0	15.68	2.31	6.3684	-4.06
310.0	15.48	2.32	6.4728	-4.15
315.0	15.28	2.33	6.5772	-4.25
320.0	15.09	2.33	6.6816	-4.35
325.0	14.90	2.34	6.786	-4.45
330.0	14.72	2.35	6.8904	-4.54
335.0	14.54	2.35	6.9948	-4.64
340.0	14.37	2.36	7.0992	-4.74
345.0	14.20	2.37	7.2036	-4.84
350.0	14.04	2.37	7.308	-4.93
355.0	13.88	2.38	7.4124	-5.03
360.0	13.72	2.39	7.5168	-5.13
Max Volume (V max):				0.74
Design Volume (V design) :				**0.74**


Sub-Area I
Storm water pond sizing using the rational method
Runoff volume and output volume (m³)
0
1
2
3
4
5
6
7
8
5
30
55
80
105
130
155
180
205
230
255
280
305
330
355
Rainfall intensity (min)
Output volume (m³)
Input volume (m³)


I-D-F Rainfall Curve
100 year
Rainfall intensity (mm/h)
300.00
250.00
200.00
150.00
100.00
50.00
0.00
5
55
105
155
205
255
305
355
Rainfall duration (min)

STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area : J 0.0082 ha
Runoff Coefficient C : 0.88
Rainfall Event : 100 year
Discharge Flow Q : 0.000246 m³/s
Discharge Factor K : 1

Design Volume: **3.16 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

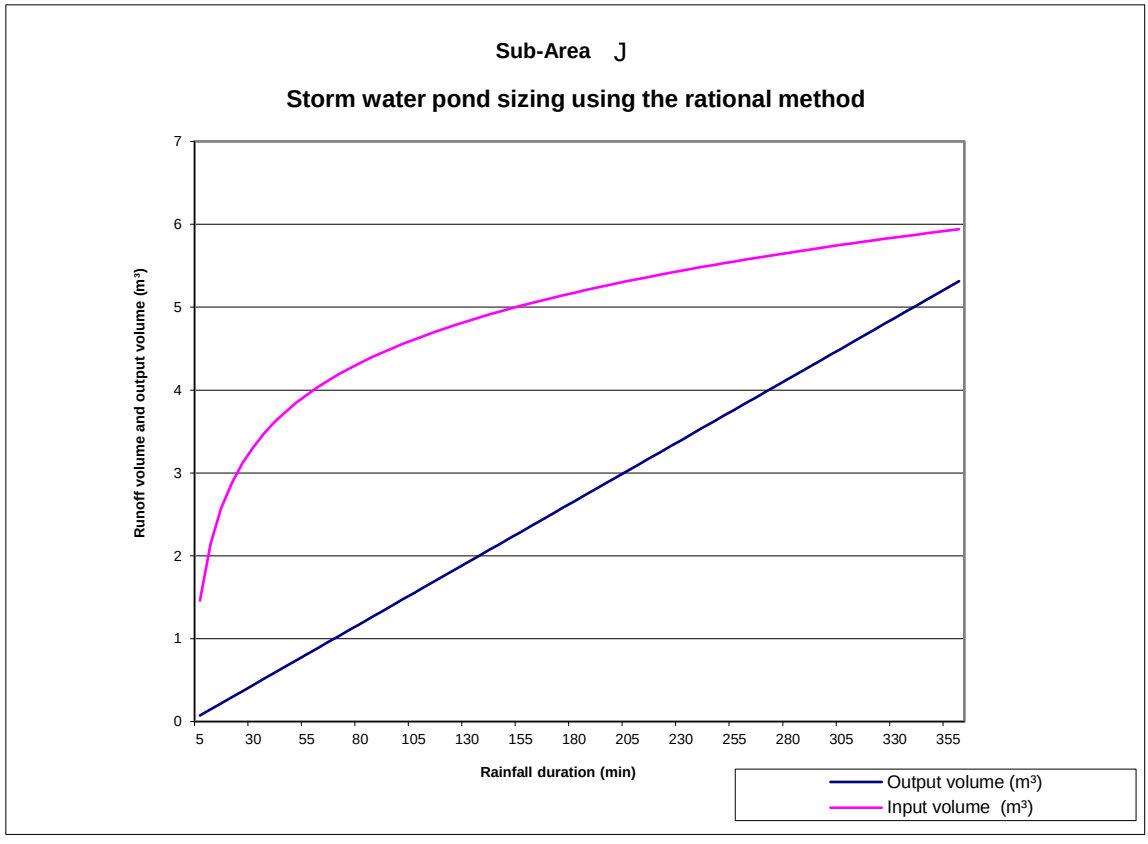
Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

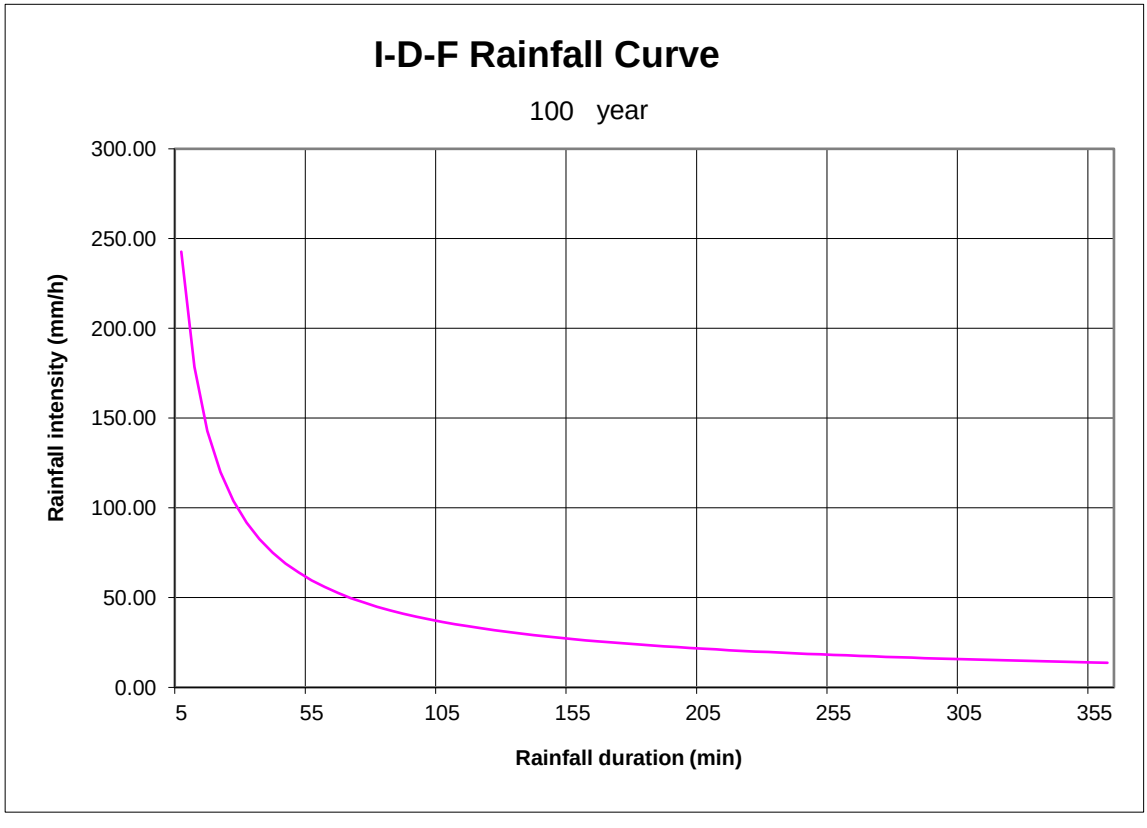
Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	1.46	0.0738	1.39
10.0	178.56	2.15	0.1476	2.00
15.0	142.89	2.58	0.2214	2.36
20.0	119.95	2.89	0.2952	2.59
25.0	103.85	3.12	0.369	2.75
30.0	91.87	3.31	0.4428	2.87
35.0	82.58	3.48	0.5166	2.96
40.0	75.15	3.61	0.5904	3.02
45.0	69.05	3.74	0.6642	3.07
50.0	63.95	3.85	0.738	3.11
55.0	59.62	3.94	0.8118	3.13
60.0	55.89	4.03	0.8856	3.15
65.0	52.65	4.12	0.9594	3.16
70.0	49.79	4.19	1.0332	3.16
75.0	47.26	4.26	1.107	3.16
80.0	44.99	4.33	1.1808	3.15
85.0	42.95	4.39	1.2546	3.14
90.0	41.11	4.45	1.3284	3.12
95.0	39.43	4.51	1.4022	3.10
100.0	37.90	4.56	1.476	3.08
105.0	36.50	4.61	1.5498	3.06
110.0	35.20	4.66	1.6236	3.03
115.0	34.01	4.70	1.6974	3.01
120.0	32.89	4.75	1.7712	2.98
125.0	31.86	4.79	1.845	2.94
130.0	30.90	4.83	1.9188	2.91
135.0	30.00	4.87	1.9926	2.88
140.0	29.15	4.91	2.0664	2.84
145.0	28.36	4.95	2.1402	2.81
150.0	27.61	4.98	2.214	2.77
155.0	26.91	5.02	2.2878	2.73
160.0	26.24	5.05	2.3616	2.69
165.0	25.61	5.08	2.4354	2.65
170.0	25.01	5.11	2.5092	2.60
175.0	24.44	5.14	2.583	2.56
180.0	23.90	5.17	2.6568	2.52
185.0	23.39	5.20	2.7306	2.47
190.0	22.90	5.23	2.8044	2.43
195.0	22.43	5.26	2.8782	2.38
200.0	21.98	5.29	2.952	2.34
205.0	21.55	5.31	3.0258	2.29
210.0	21.14	5.34	3.0996	2.24
215.0	20.75	5.37	3.1734	2.19
220.0	20.37	5.39	3.2472	2.14

225.0	20.01	5.42	3.321	2.09
230.0	19.66	5.44	3.3948	2.04
235.0	19.33	5.46	3.4686	1.99
240.0	19.01	5.49	3.5424	1.94
245.0	18.69	5.51	3.6162	1.89
250.0	18.39	5.53	3.69	1.84
255.0	18.11	5.55	3.7638	1.79
260.0	17.83	5.57	3.8376	1.74
265.0	17.56	5.60	3.9114	1.68
270.0	17.29	5.62	3.9852	1.63
275.0	17.04	5.64	4.059	1.58
280.0	16.80	5.66	4.1328	1.52
285.0	16.56	5.68	4.2066	1.47
290.0	16.33	5.70	4.2804	1.42
295.0	16.11	5.71	4.3542	1.36
300.0	15.89	5.73	4.428	1.31
305.0	15.68	5.75	4.5018	1.25
310.0	15.48	5.77	4.5756	1.19
315.0	15.28	5.79	4.6494	1.14
320.0	15.09	5.81	4.7232	1.08
325.0	14.90	5.82	4.797	1.03
330.0	14.72	5.84	4.8708	0.97
335.0	14.54	5.86	4.9446	0.91
340.0	14.37	5.88	5.0184	0.86
345.0	14.20	5.89	5.0922	0.80
350.0	14.04	5.91	5.166	0.74
355.0	13.88	5.92	5.2398	0.69
360.0	13.72	5.94	5.3136	0.63
Max Volume (V max):				3.16
Design Volume (V design) :				**3.16**

800 Palladium Dr.
Office Building





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area : K 0.0024 ha
Runoff Coefficient C : 0.95
Rainfall Event : 100 year
Discharge Flow Q : 0.000072 m³/s
Discharge Factor K : 1

Design Volume: **1.02 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

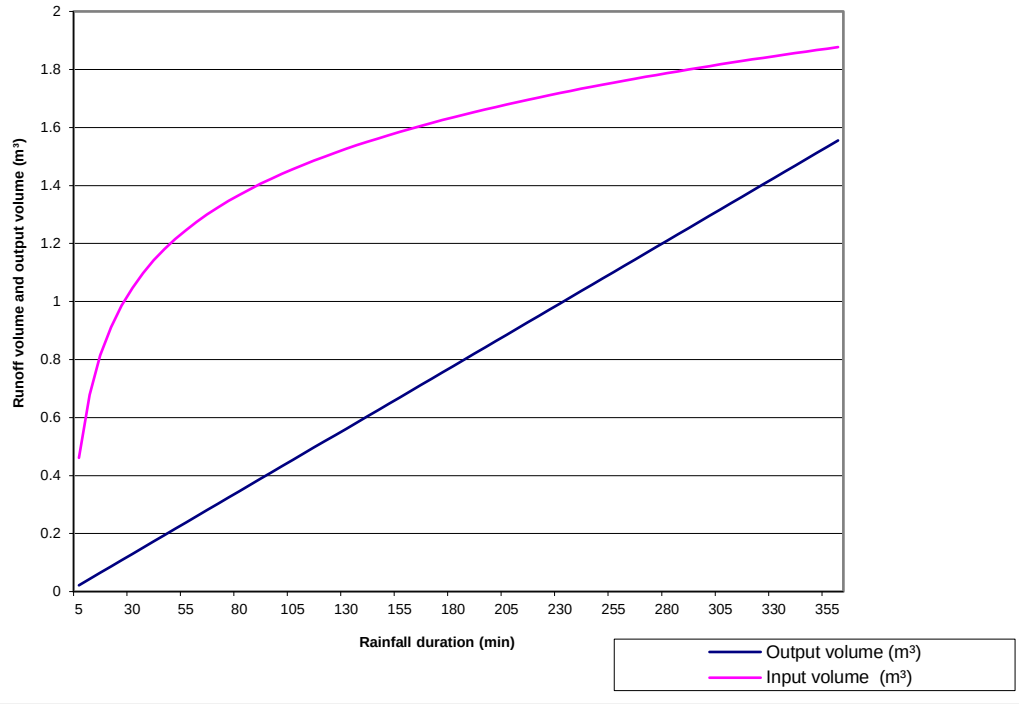
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	0.46	0.0216	0.44
10.0	178.56	0.68	0.0432	0.64
15.0	142.89	0.81	0.0648	0.75
20.0	119.95	0.91	0.0864	0.83
25.0	103.85	0.99	0.108	0.88
30.0	91.87	1.05	0.1296	0.92
35.0	82.58	1.10	0.1512	0.95
40.0	75.15	1.14	0.1728	0.97
45.0	69.05	1.18	0.1944	0.99
50.0	63.95	1.22	0.216	1.00
55.0	59.62	1.25	0.2376	1.01
60.0	55.89	1.27	0.2592	1.02
65.0	52.65	1.30	0.2808	1.02
70.0	49.79	1.32	0.3024	1.02
75.0	47.26	1.35	0.324	1.02
80.0	44.99	1.37	0.3456	1.02
85.0	42.95	1.39	0.3672	1.02
90.0	41.11	1.41	0.3888	1.02
95.0	39.43	1.42	0.4104	1.01
100.0	37.90	1.44	0.432	1.01
105.0	36.50	1.46	0.4536	1.00
110.0	35.20	1.47	0.4752	1.00
115.0	34.01	1.49	0.4968	0.99
120.0	32.89	1.50	0.5184	0.98
125.0	31.86	1.51	0.54	0.97
130.0	30.90	1.53	0.5616	0.96
135.0	30.00	1.54	0.5832	0.96
140.0	29.15	1.55	0.6048	0.95
145.0	28.36	1.56	0.6264	0.94
150.0	27.61	1.57	0.648	0.93
155.0	26.91	1.58	0.6696	0.92
160.0	26.24	1.60	0.6912	0.90
165.0	25.61	1.61	0.7128	0.89
170.0	25.01	1.62	0.7344	0.88
175.0	24.44	1.63	0.756	0.87
180.0	23.90	1.63	0.7776	0.86
185.0	23.39	1.64	0.7992	0.84
190.0	22.90	1.65	0.8208	0.83
195.0	22.43	1.66	0.8424	0.82
200.0	21.98	1.67	0.864	0.81
205.0	21.55	1.68	0.8856	0.79
210.0	21.14	1.69	0.9072	0.78
215.0	20.75	1.70	0.9288	0.77
220.0	20.37	1.70	0.9504	0.75

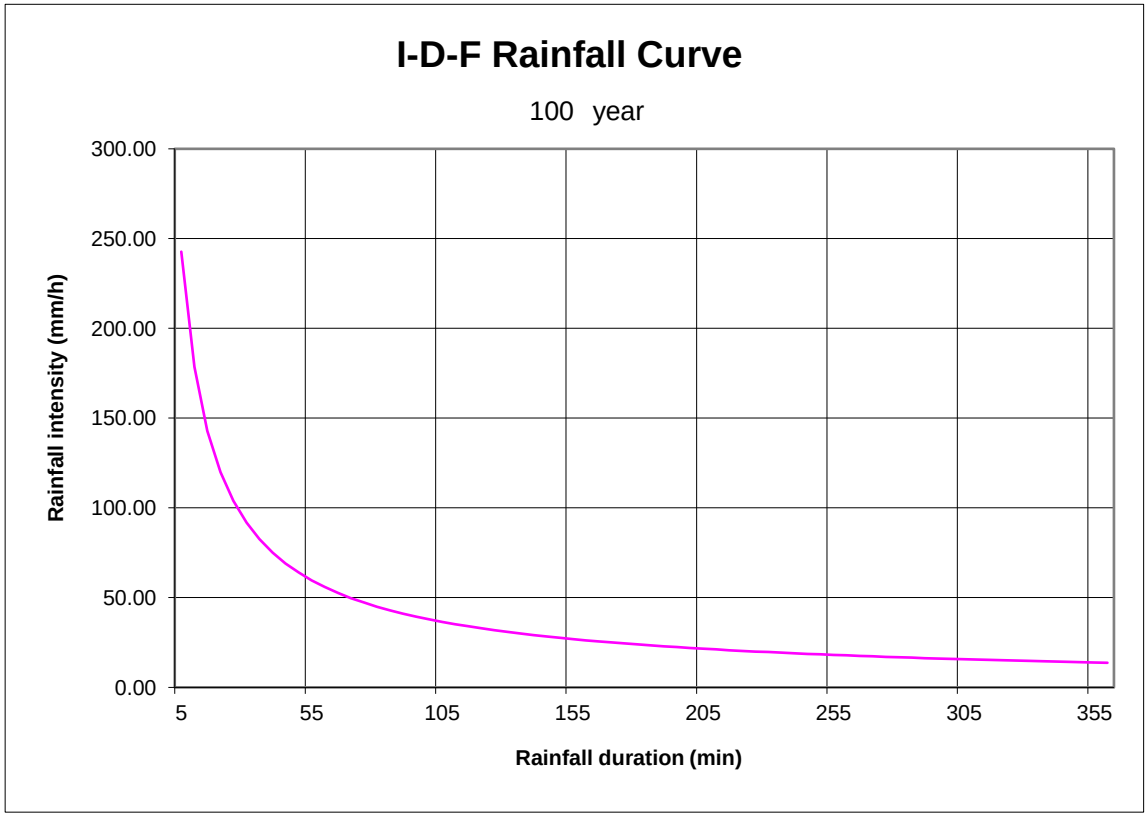
225.0	20.01	1.71	0.972	0.74
230.0	19.66	1.72	0.9936	0.72
235.0	19.33	1.73	1.0152	0.71
240.0	19.01	1.73	1.0368	0.70
245.0	18.69	1.74	1.0584	0.68
250.0	18.39	1.75	1.08	0.67
255.0	18.11	1.75	1.1016	0.65
260.0	17.83	1.76	1.1232	0.64
265.0	17.56	1.77	1.1448	0.62
270.0	17.29	1.77	1.1664	0.61
275.0	17.04	1.78	1.188	0.59
280.0	16.80	1.79	1.2096	0.58
285.0	16.56	1.79	1.2312	0.56
290.0	16.33	1.80	1.2528	0.55
295.0	16.11	1.81	1.2744	0.53
300.0	15.89	1.81	1.296	0.52
305.0	15.68	1.82	1.3176	0.50
310.0	15.48	1.82	1.3392	0.48
315.0	15.28	1.83	1.3608	0.47
320.0	15.09	1.83	1.3824	0.45
325.0	14.90	1.84	1.404	0.44
330.0	14.72	1.85	1.4256	0.42
335.0	14.54	1.85	1.4472	0.40
340.0	14.37	1.86	1.4688	0.39
345.0	14.20	1.86	1.4904	0.37
350.0	14.04	1.87	1.512	0.35
355.0	13.88	1.87	1.5336	0.34
360.0	13.72	1.88	1.5552	0.32
Max Volume (V max):				1.02
Design Volume (V design) :				**1.02**

800 Palladium Dr.
Office Building

Sub-Area K

Storm water pond sizing using the rational method





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area : L 0.0086 ha
Runoff Coefficient C : 0.9
Rainfall Event : 100 year
Discharge Flow Q : 0.000258 m³/s
Discharge Factor K : 1

Design Volume: **3.41 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

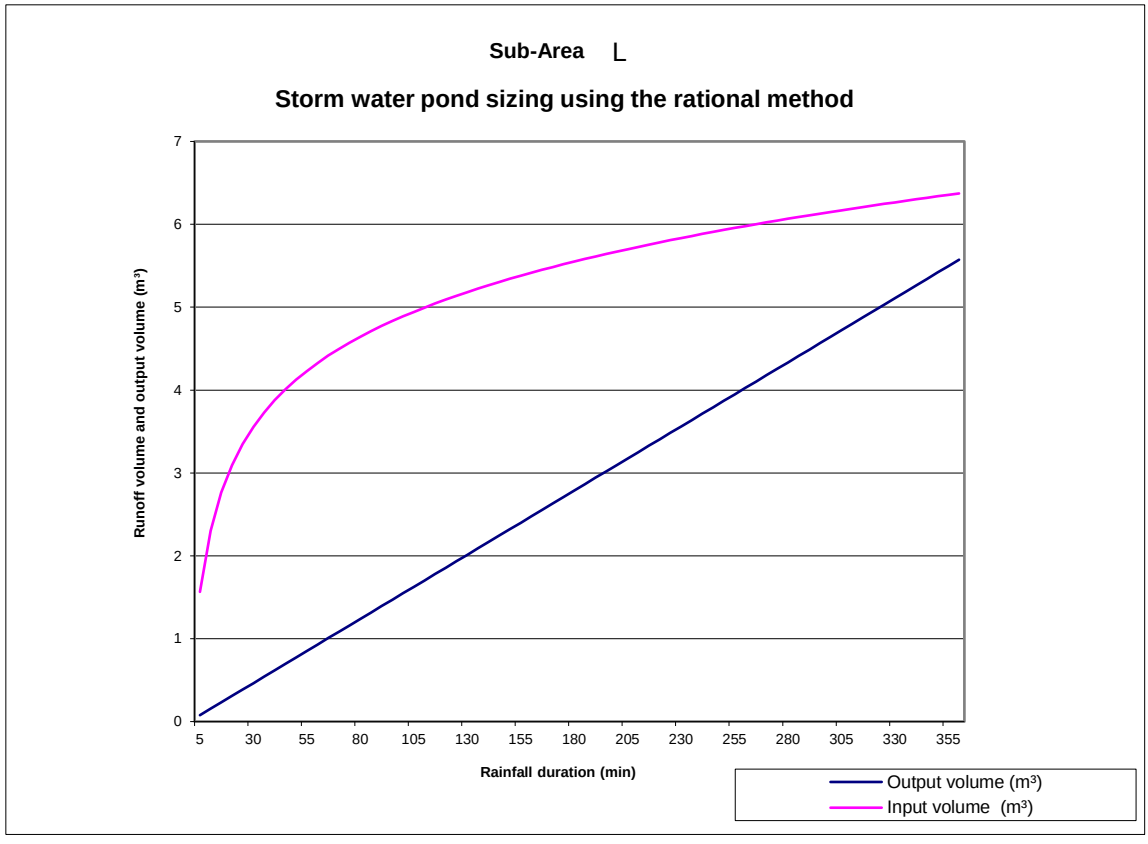
Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

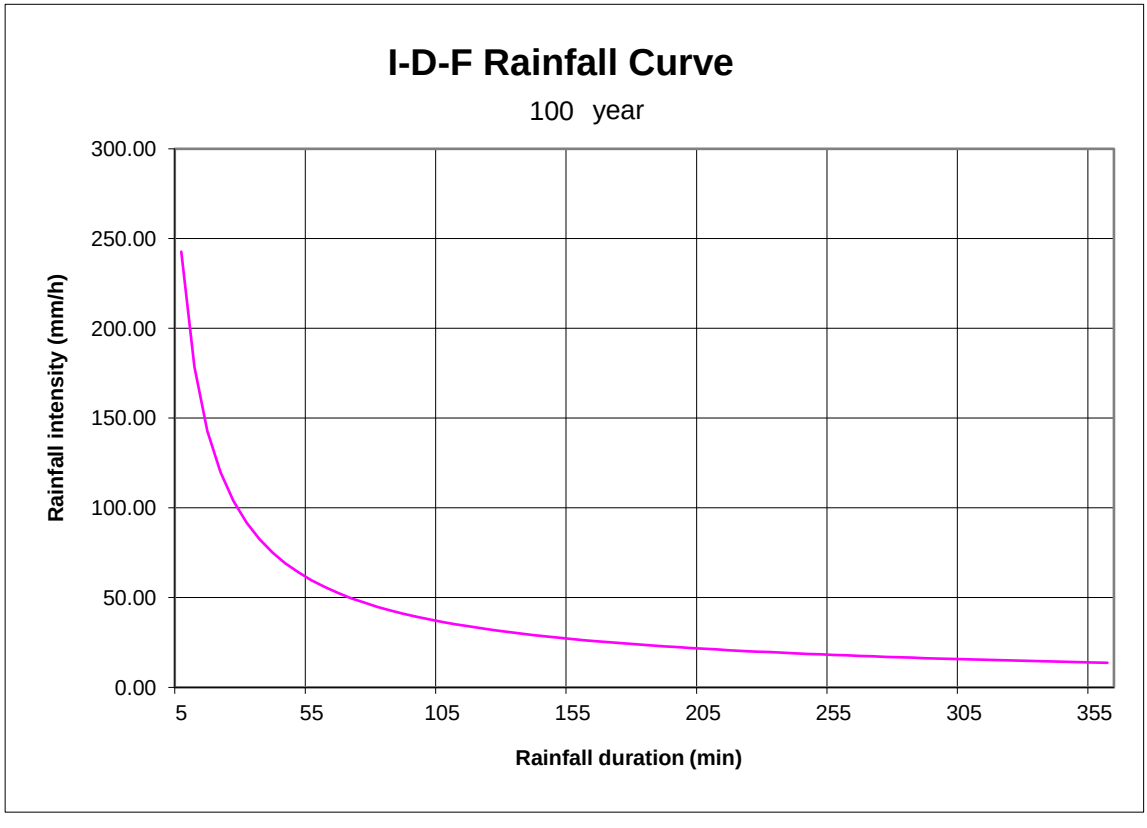
Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	1.57	0.0774	1.49
10.0	178.56	2.30	0.1548	2.15
15.0	142.89	2.77	0.2322	2.53
20.0	119.95	3.09	0.3096	2.79
25.0	103.85	3.35	0.387	2.96
30.0	91.87	3.56	0.4644	3.09
35.0	82.58	3.73	0.5418	3.19
40.0	75.15	3.88	0.6192	3.26
45.0	69.05	4.01	0.6966	3.31
50.0	63.95	4.13	0.774	3.35
55.0	59.62	4.23	0.8514	3.38
60.0	55.89	4.33	0.9288	3.40
65.0	52.65	4.41	1.0062	3.41
70.0	49.79	4.50	1.0836	3.41
75.0	47.26	4.57	1.161	3.41
80.0	44.99	4.64	1.2384	3.40
85.0	42.95	4.71	1.3158	3.39
90.0	41.11	4.77	1.3932	3.38
95.0	39.43	4.83	1.4706	3.36
100.0	37.90	4.89	1.548	3.34
105.0	36.50	4.94	1.6254	3.32
110.0	35.20	5.00	1.7028	3.29
115.0	34.01	5.04	1.7802	3.26
120.0	32.89	5.09	1.8576	3.23
125.0	31.86	5.14	1.935	3.20
130.0	30.90	5.18	2.0124	3.17
135.0	30.00	5.22	2.0898	3.13
140.0	29.15	5.26	2.1672	3.10
145.0	28.36	5.30	2.2446	3.06
150.0	27.61	5.34	2.322	3.02
155.0	26.91	5.38	2.3994	2.98
160.0	26.24	5.42	2.4768	2.94
165.0	25.61	5.45	2.5542	2.90
170.0	25.01	5.48	2.6316	2.85
175.0	24.44	5.52	2.709	2.81
180.0	23.90	5.55	2.7864	2.76
185.0	23.39	5.58	2.8638	2.72
190.0	22.90	5.61	2.9412	2.67
195.0	22.43	5.64	3.0186	2.62
200.0	21.98	5.67	3.096	2.58
205.0	21.55	5.70	3.1734	2.53
210.0	21.14	5.73	3.2508	2.48
215.0	20.75	5.76	3.3282	2.43
220.0	20.37	5.78	3.4056	2.38

225.0	20.01	5.81	3.483	2.33
230.0	19.66	5.83	3.5604	2.27
235.0	19.33	5.86	3.6378	2.22
240.0	19.01	5.88	3.7152	2.17
245.0	18.69	5.91	3.7926	2.12
250.0	18.39	5.93	3.87	2.06
255.0	18.11	5.96	3.9474	2.01
260.0	17.83	5.98	4.0248	1.95
265.0	17.56	6.00	4.1022	1.90
270.0	17.29	6.02	4.1796	1.84
275.0	17.04	6.05	4.257	1.79
280.0	16.80	6.07	4.3344	1.73
285.0	16.56	6.09	4.4118	1.68
290.0	16.33	6.11	4.4892	1.62
295.0	16.11	6.13	4.5666	1.56
300.0	15.89	6.15	4.644	1.51
305.0	15.68	6.17	4.7214	1.45
310.0	15.48	6.19	4.7988	1.39
315.0	15.28	6.21	4.8762	1.33
320.0	15.09	6.23	4.9536	1.27
325.0	14.90	6.25	5.031	1.22
330.0	14.72	6.27	5.1084	1.16
335.0	14.54	6.28	5.1858	1.10
340.0	14.37	6.30	5.2632	1.04
345.0	14.20	6.32	5.3406	0.98
350.0	14.04	6.34	5.418	0.92
355.0	13.88	6.36	5.4954	0.86
360.0	13.72	6.37	5.5728	0.80
Max Volume (V max):				3.41
Design Volume (V design) :				**3.41**

800 Palladium Dr.
Office Building





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area : M 0.0151 ha
Runoff Coefficient C : 0.25
Rainfall Event : 100 year
Discharge Flow Q : 0.000453 m³/s
Discharge Factor K : 1

Design Volume: **0.97 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

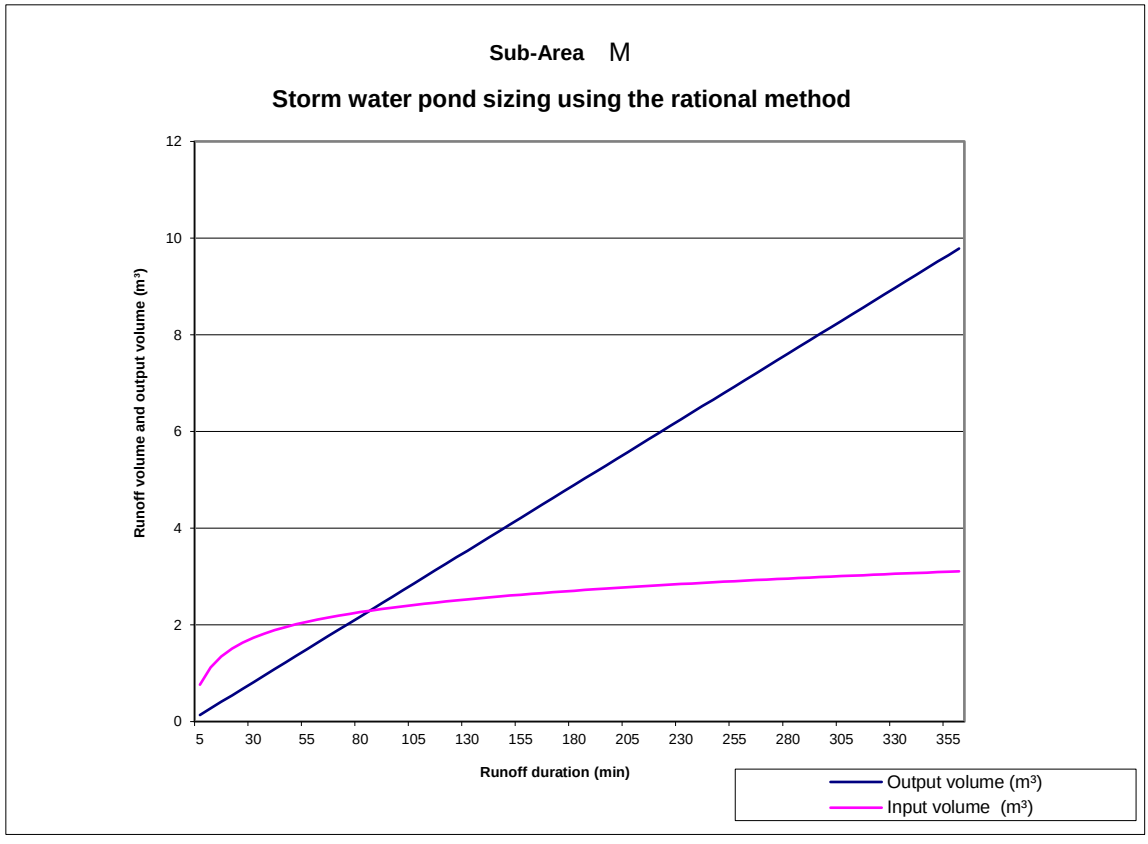
Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

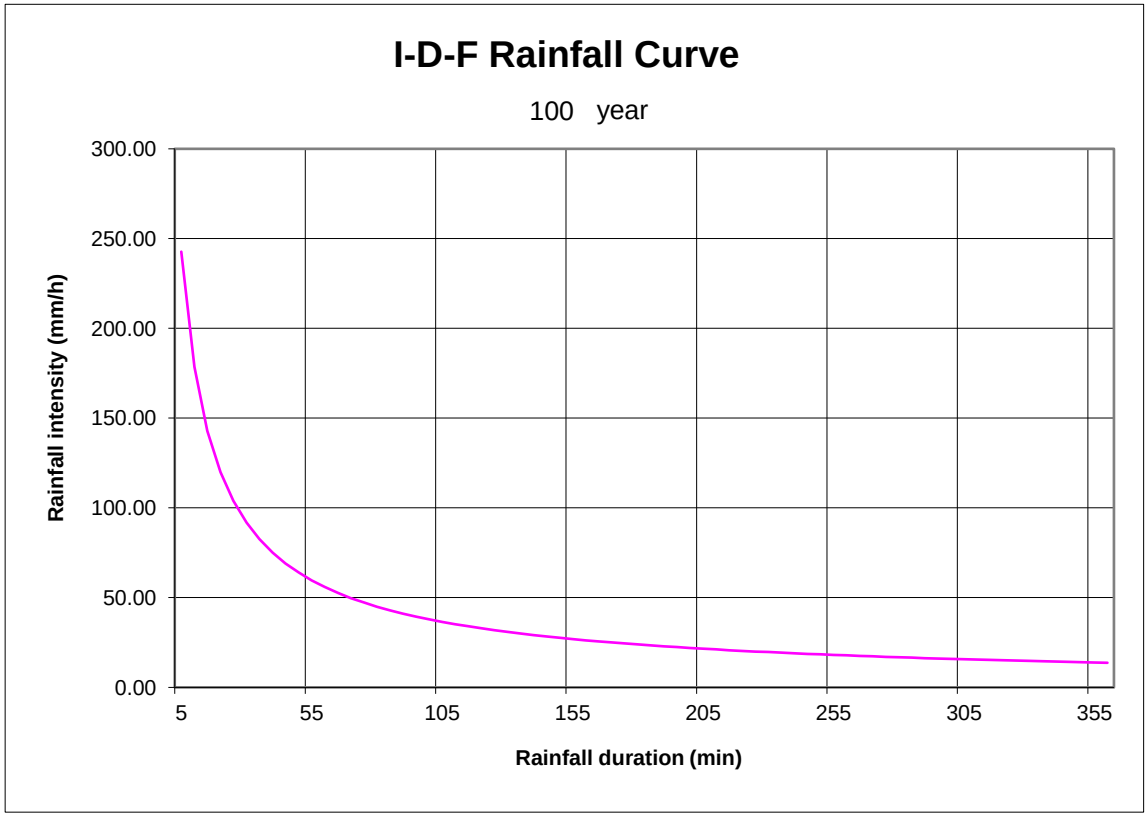
Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	0.76	0.1359	0.63
10.0	178.56	1.12	0.2718	0.85
15.0	142.89	1.35	0.4077	0.94
20.0	119.95	1.51	0.5436	0.97
25.0	103.85	1.63	0.6795	0.95
30.0	91.87	1.73	0.8154	0.92
35.0	82.58	1.82	0.9513	0.87
40.0	75.15	1.89	1.0872	0.80
45.0	69.05	1.95	1.2231	0.73
50.0	63.95	2.01	1.359	0.65
55.0	59.62	2.06	1.4949	0.57
60.0	55.89	2.11	1.6308	0.48
65.0	52.65	2.15	1.7667	0.39
70.0	49.79	2.19	1.9026	0.29
75.0	47.26	2.23	2.0385	0.19
80.0	44.99	2.26	2.1744	0.09
85.0	42.95	2.30	2.3103	-0.01
90.0	41.11	2.33	2.4462	-0.12
95.0	39.43	2.36	2.5821	-0.23
100.0	37.90	2.38	2.718	-0.33
105.0	36.50	2.41	2.8539	-0.44
110.0	35.20	2.44	2.9898	-0.55
115.0	34.01	2.46	3.1257	-0.67
120.0	32.89	2.48	3.2616	-0.78
125.0	31.86	2.51	3.3975	-0.89
130.0	30.90	2.53	3.5334	-1.01
135.0	30.00	2.55	3.6693	-1.12
140.0	29.15	2.57	3.8052	-1.24
145.0	28.36	2.59	3.9411	-1.35
150.0	27.61	2.61	4.077	-1.47
155.0	26.91	2.62	4.2129	-1.59
160.0	26.24	2.64	4.3488	-1.71
165.0	25.61	2.66	4.4847	-1.83
170.0	25.01	2.68	4.6206	-1.95
175.0	24.44	2.69	4.7565	-2.07
180.0	23.90	2.71	4.8924	-2.19
185.0	23.39	2.72	5.0283	-2.31
190.0	22.90	2.74	5.1642	-2.43
195.0	22.43	2.75	5.3001	-2.55
200.0	21.98	2.77	5.436	-2.67
205.0	21.55	2.78	5.5719	-2.79
210.0	21.14	2.79	5.7078	-2.91
215.0	20.75	2.81	5.8437	-3.04
220.0	20.37	2.82	5.9796	-3.16

225.0	20.01	2.83	6.1155	-3.28
230.0	19.66	2.85	6.2514	-3.41
235.0	19.33	2.86	6.3873	-3.53
240.0	19.01	2.87	6.5232	-3.65
245.0	18.69	2.88	6.6591	-3.78
250.0	18.39	2.89	6.795	-3.90
255.0	18.11	2.90	6.9309	-4.03
260.0	17.83	2.92	7.0668	-4.15
265.0	17.56	2.93	7.2027	-4.28
270.0	17.29	2.94	7.3386	-4.40
275.0	17.04	2.95	7.4745	-4.53
280.0	16.80	2.96	7.6104	-4.65
285.0	16.56	2.97	7.7463	-4.78
290.0	16.33	2.98	7.8822	-4.90
295.0	16.11	2.99	8.0181	-5.03
300.0	15.89	3.00	8.154	-5.15
305.0	15.68	3.01	8.2899	-5.28
310.0	15.48	3.02	8.4258	-5.41
315.0	15.28	3.03	8.5617	-5.53
320.0	15.09	3.04	8.6976	-5.66
325.0	14.90	3.05	8.8335	-5.79
330.0	14.72	3.06	8.9694	-5.91
335.0	14.54	3.06	9.1053	-6.04
340.0	14.37	3.07	9.2412	-6.17
345.0	14.20	3.08	9.3771	-6.29
350.0	14.04	3.09	9.513	-6.42
355.0	13.88	3.10	9.6489	-6.55
360.0	13.72	3.11	9.7848	-6.68
Max Volume (V max):				0.97
Design Volume (V design) :				**0.97**

800 Palladium Dr.
Office Building





STORAGE VOLUME CALCULATIONS

Project: 800 Palladium Dr.
Office Building
Project #: A000919 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 5/27/2019 14:36

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 30 L/s/ha

Area	**:** Building	0.2768	ha
Runoff Coefficient C :		0.95	
Rainfall Event :		100	year
Discharge Flow Q :		0.008304	m³/s
Discharge Factor K :		1	

Design Volume: **117.96 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Benjamin Tardioli, EIT Date: 2019-05-27

Verified by: Tim Kennedy, P.Eng Date: 2019-05-27

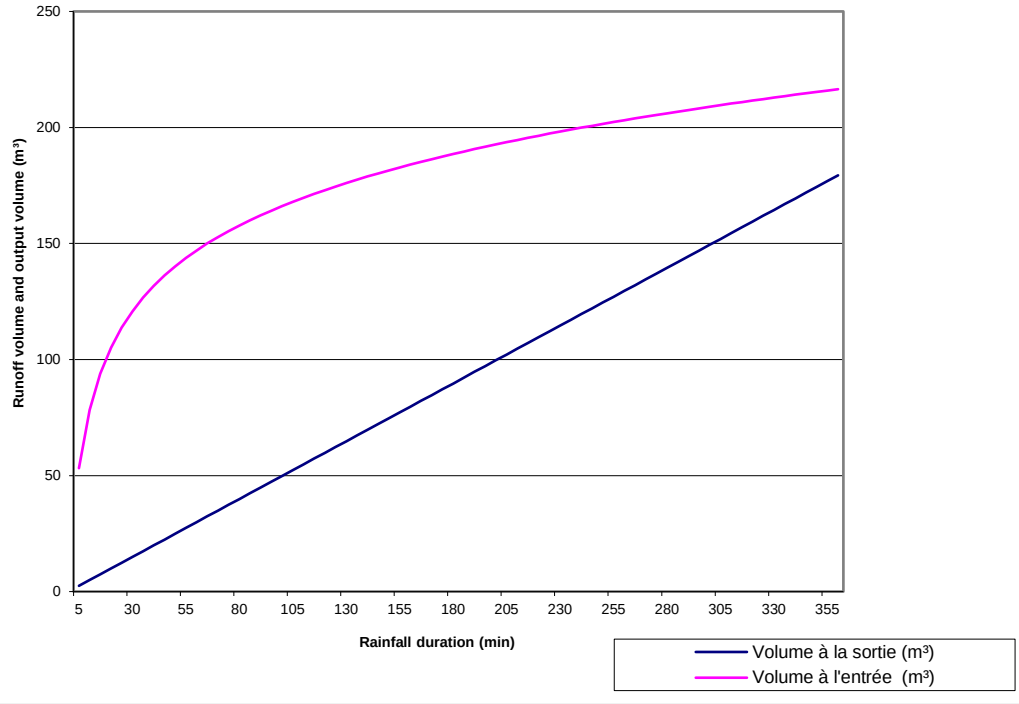
Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	53.18	2.4912	50.69
10.0	178.56	78.26	4.9824	73.27
15.0	142.89	93.94	7.4736	86.47
20.0	119.95	105.14	9.9648	95.18
25.0	103.85	113.78	12.456	101.33
30.0	91.87	120.79	14.9472	105.84
35.0	82.58	126.67	17.4384	109.23
40.0	75.15	131.73	19.9296	111.81
45.0	69.05	136.18	22.4208	113.76
50.0	63.95	140.14	24.912	115.23
55.0	59.62	143.72	27.4032	116.32
60.0	55.89	146.98	29.8944	117.09
65.0	52.65	149.98	32.3856	117.59
70.0	49.79	152.75	34.8768	117.87
75.0	47.26	155.33	37.368	117.96
80.0	44.99	157.74	39.8592	117.88
85.0	42.95	160.01	42.3504	117.66
90.0	41.11	162.16	44.8416	117.32
95.0	39.43	164.19	47.3328	116.85
100.0	37.90	166.12	49.824	116.29
105.0	36.50	167.95	52.3152	115.64
110.0	35.20	169.71	54.8064	114.90
115.0	34.01	171.39	57.2976	114.09
120.0	32.89	173.00	59.7888	113.21
125.0	31.86	174.55	62.28	112.27
130.0	30.90	176.04	64.7712	111.27
135.0	30.00	177.48	67.2624	110.22
140.0	29.15	178.87	69.7536	109.12
145.0	28.36	180.21	72.2448	107.97
150.0	27.61	181.51	74.736	106.78
155.0	26.91	182.77	77.2272	105.55
160.0	26.24	184.00	79.7184	104.28
165.0	25.61	185.19	82.2096	102.98
170.0	25.01	186.34	84.7008	101.64
175.0	24.44	187.47	87.192	100.27
180.0	23.90	188.56	89.6832	98.88
185.0	23.39	189.63	92.1744	97.46
190.0	22.90	190.67	94.6656	96.01
195.0	22.43	191.69	97.1568	94.53
200.0	21.98	192.68	99.648	93.04
205.0	21.55	193.66	102.1392	91.52
210.0	21.14	194.61	104.6304	89.97
215.0	20.75	195.53	107.1216	88.41
220.0	20.37	196.45	109.6128	86.83

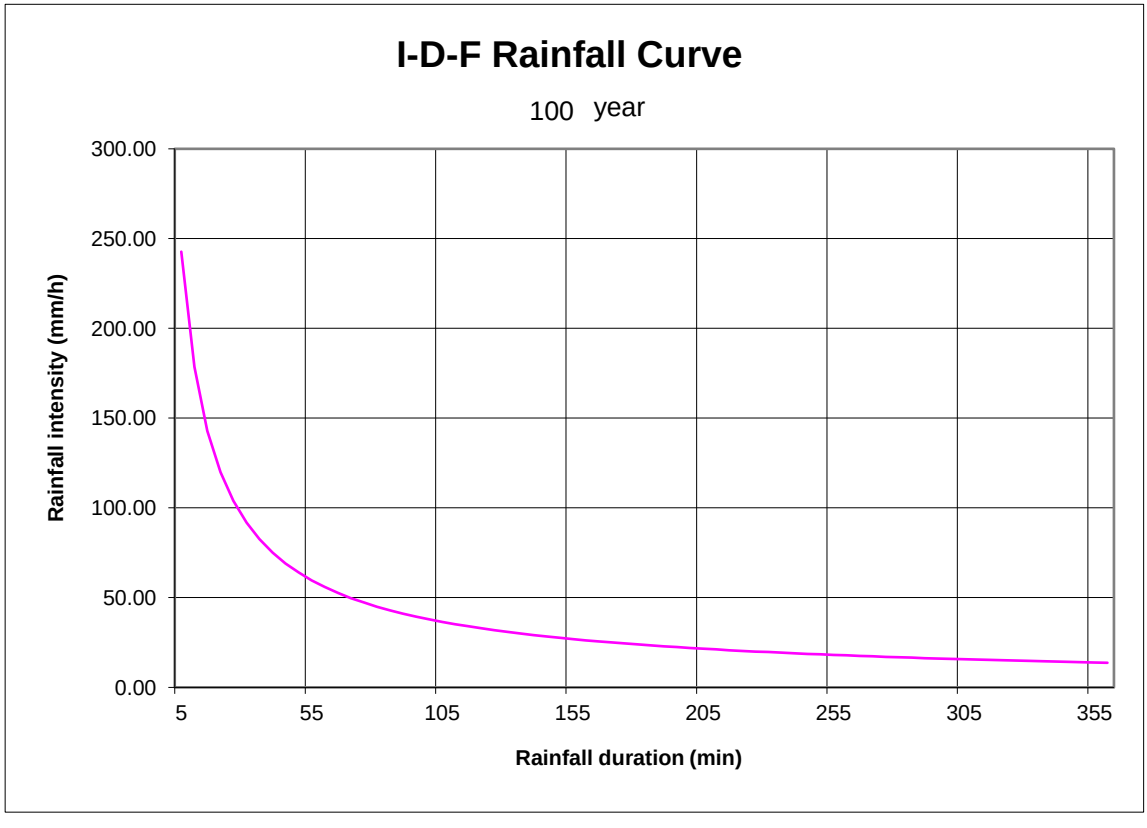
225.0	20.01	197.34	112.104	85.23
230.0	19.66	198.21	114.5952	83.62
235.0	19.33	199.07	117.0864	81.98
240.0	19.01	199.91	119.5776	80.33
245.0	18.69	200.74	122.0688	78.67
250.0	18.39	201.55	124.56	76.99
255.0	18.11	202.34	127.0512	75.29
260.0	17.83	203.12	129.5424	73.58
265.0	17.56	203.89	132.0336	71.86
270.0	17.29	204.65	134.5248	70.12
275.0	17.04	205.39	137.016	68.38
280.0	16.80	206.12	139.5072	66.62
285.0	16.56	206.85	141.9984	64.85
290.0	16.33	207.55	144.4896	63.06
295.0	16.11	208.25	146.9808	61.27
300.0	15.89	208.94	149.472	59.47
305.0	15.68	209.62	151.9632	57.66
310.0	15.48	210.29	154.4544	55.83
315.0	15.28	210.95	156.9456	54.00
320.0	15.09	211.60	159.4368	52.16
325.0	14.90	212.24	161.928	50.31
330.0	14.72	212.87	164.4192	48.45
335.0	14.54	213.49	166.9104	46.58
340.0	14.37	214.11	169.4016	44.71
345.0	14.20	214.72	171.8928	42.82
350.0	14.04	215.32	174.384	40.93
355.0	13.88	215.91	176.8752	39.03
360.0	13.72	216.49	179.3664	37.13
Max Volume (V max):				117.96
Design Volume (V design) :				**117.96**

800 Palladium Dr.
Office Building

Sub-Area Building

Storm water pond sizing using the rational method





SAMPLE CALCULATIONS – SUB-CATCHMENT B

Storage Required for the 100yr Rainfall Event (V_{rain}):

Rainfall Duration (T) = 40 min

- 5 min time-steps were used to determine at which time the maximum storage volume requirement occurs. In this case the maximum storage requirement occurred at 60 minutes.

Rainfall Intensity (I) = 75.15 mm/hr

- $I = 1735.688 / (\text{time in minutes} + 6.014)^{0.820}$
  $= 1735.688 / (60 \text{ min} + 6.014)^{0.820}$
  $= 55.89$ mm/hr
- formula as per City of Ottawa Sewer Design Guidelines

Runoff Volume (CIAT) = 91.44 m^3

- Runoff Coefficient (C) = 0.95
- Area (A) = 0.1722 ha
- CIAT = 0.95 x (55.89mm/hr x 0.001m/mm) x (0.1722ha x 10000m^2/ha) x (40min x 1hr/60min)
  = 91.44 m^3

Output Volume (KQT) = 23.32 m^3

- Discharge Factor (K) = 1
- Release Rate (Q_{rel})
- Flow (Q) = A x Q_{rel}
  = 0.1722 ha x 37.62 L/s/ha
  = 6.478 L/s
  = 0.006478 m^3/s
- KQT = 1 x 0.006478 m^3/s x (60 min x 60 s/min)
  = 23.32 m^3

Retention Volume = Runoff Volume – Output Volume
= 91.44 m^3 – 23.32 m^3
= 68.12 m^3

Available Storage for the 100yr Rainfall Event (V_{rain}):

A combination of Surface storage, Rain Garden and Underground storage was required to store the 100yr event

Rain garden storage = 24 m^3
Elevation of CB = 95.00
Maximum elevation before overflow = 95.550
Y_{max} = 0.55 m
Capacity Surface Area (measured surface circle at 95.55) = 131 m^2

V_{max} (cone) = 142 x 0.55/3 = **26.0 m^3**

Parking Surface Storage = 90.0 m^3
Elevation of CB = 95.550
Maximum elevation before overflow = 95.850
Y_{max} = 0.3 m
Capacity Surface Area (measured surface circle at 95.850) = 1326m^2
V_{max} (cone) = 900 x 0.3/3 = **132.6 m^3**

Underground Storage = 9.5 m^3
Summarized from ADS Canada Flip Book p. 76

Arch Model	Length (mm)	Width (mm)	Height (mm)	Volume (m^3)	Volume/Meter
SC-310	2169	864	406	0.42	0.19 m^3/m
SC-740	2169	1295	762	1.30	0.59 m^3/m
MC-3500	2184	1956	1143	3.01	1.4 m^3/m

Model used in Area B: SC-310
Length of underground arch = 50m
V_{max} = 0.19 m^3/m *50m = **9.5 m^3**

Total Available Storage for Area B = **168.1 m^3**

Drawdown Time:

Areas A and B are controlled by a single ICD with a release rate 13.33 L/s and therefore work together to storm the required retention volume

Require Retention Volume (A+B) = 72.07 + 68.12 = 140.19 m^3
Available Rain Garden and Underground Storage = 35.5 m^3

Remaining Volume on Parking Surface for 100yr event

V_{acc}= 140.19 – 35.5 = 104.69 m^3

- Drawdown time = V_{acc} / Q
  = 104.69 m^3 / 13.33 L/s / 1000 L/ m^3 / 60 s/min
  = 131 min

Ponding Elevations:

Capacity Surface Area for both A and B is the measured surface circle at 95.850.

Area	Elevation CB	Maximum Elevation	Ymax	Capacity Area	Available Storage
A	95.570	95.850	0.28	558	184.68
B	95.550	95.850	0.30	1326	132.6

Require Retention Volume (A+B) = 72.07 + 68.12 = 140.19 m^3
Available Rain Garden and Underground Storage = 35.5 m^3

Remaining Volume on Parking Surface for 100yr event

V_{acc}= 140.19 – 35.5 = 104.69 m^3

Volume Stored in each area is a factor on the available volume in each area.

Retention volume in Area B

V_{acc}(B) = 104.69 m^3 x (132.6/184.68) = 75.17 m^3

100yr pond height = (3*75.17 / (1326/0.3)) $^{0.5}$ = 0.226

100yr pond elevation = 95.550 +0.23m = **95.78**

STORM SEWER HYDRAULIC DESIGN SHEET (SSDS) - RATIONAL METHOD - PROPOSED RELEASE FLOW FOR PIPE SIZING

Client: Cominar
Project: 800 Palladium Dr.
Location: OTTAWA, ONTARIO
Project #: A000919

Manning Coefficient: 0.013
Maximum Permitted Velocity: 3.00 m/s
Minimum Permitted Velocity: 0.80 m/s
Return Frequency: 2 years

LOCATION			AREA		FLOW					SEWER DATA							
Street/Catchment Name	From MH/CB	To MH/CB	AREA (ha)	C =	Section 2.78*AC (ha)	Accum 2.78*AC (ha)	Time of Conc (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Diameter (mm)	Material Type	Slope (%)	Length (m)	Capacity (full) (L/s)	Velocity (full) (m/s)	Time of Flow (min)	Ratio (%)
A	CBHM-1	CBMH-4	0.182	0.810	0.410	0.410	10.00	76.805	31.51	300	PVC	0.50%	50.00	68.38	0.97	0.88	46%
B	CB-12	Sewer	0.172	0.810	0.388	0.388	10.88	73.573	28.53	250	PVC	0.50%	4.50	42.05	0.86	0.08	68%
	CBMH-4	MH-4							13.33	250	PVC	2.00%	14.00	84.10	1.71	0.19	16%
	MH-4	MH-1							13.33	250	PVC	0.50%	30.40	42.05	0.86	0.67	32%
	MH1	Street							13.33	200	PVC	1.00%	90.00	32.80	1.04	1.52	41%
D	CB-2	CBMH-2	0.115	0.730	0.233	0.233	10.00	76.805	17.89	200	PVC	0.30%	31.20	17.96	0.57	0.85	100%
C	CBMH-2	CBMH-5	0.137	0.860	0.327	0.327	10.85	73.699	41.98	250	PVC	0.50%	40.60	42.05	0.86	0.76	100%
F	CB-4	CB-3	0.136	0.800	0.302	0.302	10.00	76.805	23.18	250	PVC	0.50%	36.00	42.05	0.86	0.68	55%
	CB-3	CBMH-5					10.68		23.18	250	PVC	2.00%	45.00	84.10	1.71	0.52	28%
E	CBMH-5	MH-2	0.147	0.800	0.327	0.327	11.36	71.938	20.33	250	PVC	3.00%	3.00	103.00	2.10	0.03	20%
	MH-2	Street							20.33	200	PVC	1.00%	31.00	32.80	1.04	0.47	62%
M	CB12	CB-11	0.015	0.200	0.008	0.008	10.00	76.805	0.64	250	HDPE	0.50%	19.30	42.05	0.86	1.01	2%
L	CB11	CB-10	0.009	0.720	0.017	0.017	11.01	73.138	1.90	250	HDPE	0.50%	8.10	42.05	0.86	0.31	5%
K	CB10	CB-9	0.002	0.900	0.006	0.006	11.32	72.073	2.34	250	HDPE	0.50%	8.50	42.05	0.86	0.32	6%
J	CB9	CB-8	0.008	0.700	0.016	0.016	11.64	71.037	3.47	250	HDPE	0.50%	18.90	42.05	0.86	0.61	8%
I	CB8	CB-7	0.012	0.200	0.006	0.006	12.25	69.124	3.92	250	HDPE	0.50%	8.80	42.05	0.86	0.28	9%
H	CBMH1	MH3	0.006	0.900	0.015	0.015	12.53	68.292	4.92	250	PVC	0.50%	10.00	42.05	0.86	0.30	12%
G	CBMH2	MH4	0.033	0.390	0.035	0.035	12.83	67.425	7.31	251	PVC	0.50%	11.00	42.50	0.86	0.29	17%
Building	Building	MH3	0.279	0.900	0.697	0.697	12.83	67.425	40.40	200	PVC	2.00%	2.00	46.38	1.48	0.02	87%
	MH3	MH5							10.84	250	PVC	2.00%	3.00	84.10	1.71	0.04	13%
	MH5	Street							10.84	200	PVC	1.00%	7.00	32.80	1.04	0.13	33%

Design Parameters:

Rational Formula: $Q_{peak} = 2.78*CIA$

Where:
Q = Peak Flow (L/s)
C = Runoff Coefficient
I = Rainfall Intensity (mm/hr) = 998.071/(time(min) + 6.053)^0.814 (City of Ottawa Design Giudeline for 2 year event)
A = Area (ha)
T = Time of Concentration (in minutes)

Time of Concentration: Tc = Ti + Tf (minutes)

Where:
Ti = inlet time before pipe (minutes)
Tf = time of flow in pipe (minutes)

Where:
Tf = L/(60V)
L = Pipe Length (m)
V = Actual Velocity (m/s)

Manning Equation: $Q_{cap} = 1/n*A*R^{2/3}*S^{1/2}$

Where:
n = Manning Roughness Coefficient
A = Area of Flow (m^2)
R = Hydraulic Radius (defined as area of flow (m^2) divided by wetted perimeter (m))
S = Slope of Pipe (%)

Prepared by: Benjamin Tardioli, EIT Date: 5/27/2019

Verified by: Tim Kennedy, P.Eng. Date: 5/27/2019

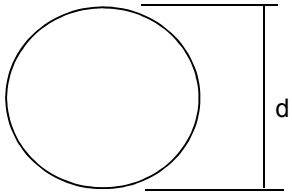
ORIFICE PLATE DIMENSION

Project: 800 Palladium Dr.
Project No.: A000919-360

5/28/2019

ICD # 1

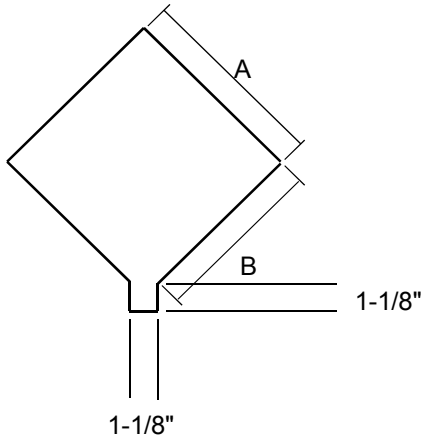
Control Device	Maximum Flow	Maximum Head	Calculated Opening	Diameter
Orifice	L/sec	m	mm²	mm
Circular	13.333	1.58	3932	71
				inches
				2.79



$$A = \frac{Q}{c\sqrt{2gH}}$$

c = 0.61

Control Device	Maximum Flow	Maximum Head	Calculated Opening	A	B
Orifice	L/sec	m	mm²	mm	mm
Diamond	13.333	1.58	3932	58	37
				inches	inches
				2.27	1.47



$$A = \frac{Q}{c\sqrt{2gH}}$$

c = 0.61

Choice: Orifice Cap

Prepared by: Benjamin Tardioli, EIT

Date: 2019-03-06

Verified by: Tim Kennedy, P.Eng.

Date: 2019-03-06

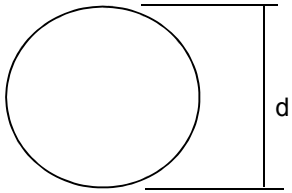
ORIFICE PLATE DIMENSION

Project: 800 Palladium Dr.
Project No.: A000919-360

5/28/2019

ICD # 2

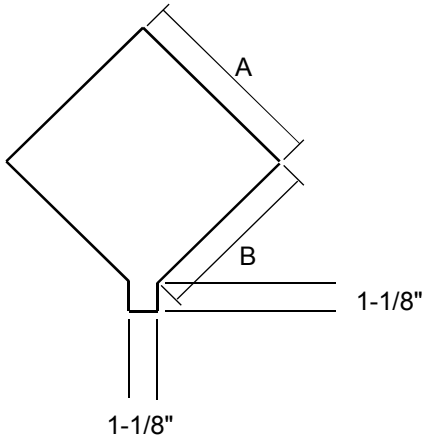
Control Device	Maximum Flow	Maximum Head	Calculated Opening	Diameter
Orifice	L/sec	m	mm²	mm
Circular	20.330	1.62	5902	87
				inches
				3.41



$$A = \frac{Q}{c\sqrt{2gH}}$$

c = 0.61

Control Device	Maximum Flow	Maximum Head	Calculated Opening	A	B
Orifice	L/sec	m	mm²	mm	mm
Diamond	20.330	1.62	5902	73	53
				inches	inches
				2.86	2.07



$$A = \frac{Q}{c\sqrt{2gH}}$$

c = 0.61

Choice: Orifice Cap

Prepared by: Benjamin Tardioli, EIT

Date: 2019-03-06

Verified by: Tim Kennedy, P.Eng.

Date: 2019-03-06

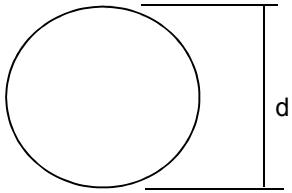
ORIFICE PLATE DIMENSION

Project: 800 Palladium Dr.
Project No.: A000919-360

5/28/2019

ICD # 3

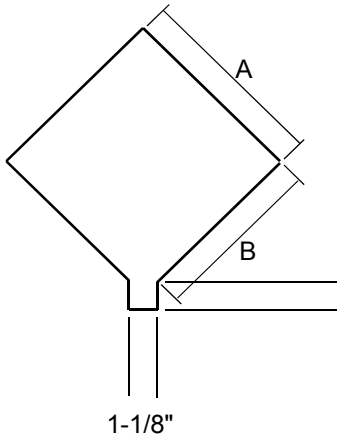
Control Device	Maximum Flow	Maximum Head	Calculated Opening	Diameter
Orifice	L/sec	m	mm²	mm
Circular	10.836	1.99	2846	60
				inches
				2.37



$$A = \frac{Q}{c\sqrt{2gH}}$$

c = 0.61

Control Device	Maximum Flow	Maximum Head	Calculated Opening	A	B
Orifice	L/sec	m	mm²	mm	mm
Diamond	10.836	1.99	2846	47	27
				inches	inches
				1.86	1.07



$$A = \frac{Q}{c\sqrt{2gH}}$$

c = 0.61

Choice: Vortex

Prepared by: Benjamin Tardioli, EIT

Date: 2019-03-06

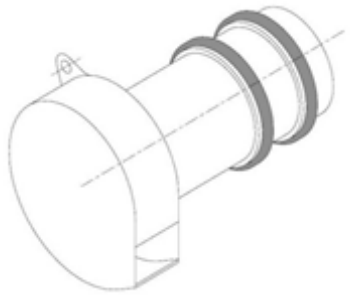
Verified by: Tim Kennedy, P.Eng.

Date: 2019-03-06

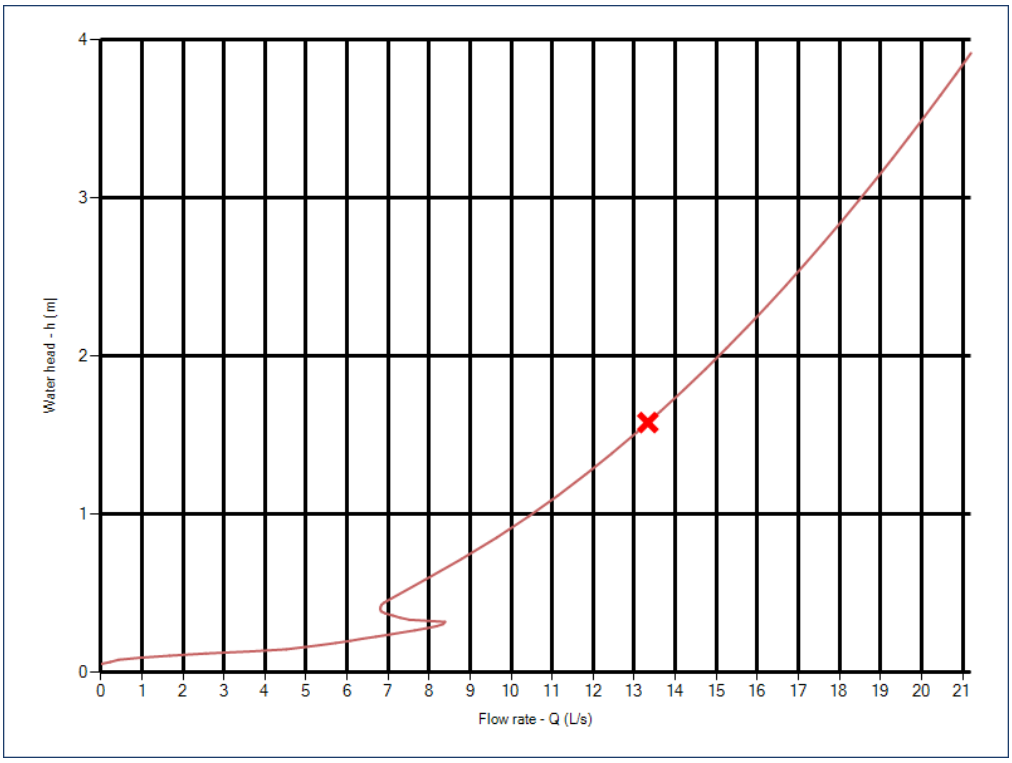
DATA SHEET
HYDROVEX® VHV
VORTEX REGULATOR

GENERAL INFORMATION

Application	Stormwater	
Project name	CITY OF OTTAWA, ON	
Project number	CIMA	
Regulator ID		
Design flow (Q)	13.33	L/s
Design head (h)	1.58	m
Outlet pipe diameter (C)	250	mm
Model	100 VHV-1,10,STD	
item #	PRIPHY200281	
Quantity	1	
Minimum clearance (H)	200	mm
Minimum manhole diameter (B)	900	mm

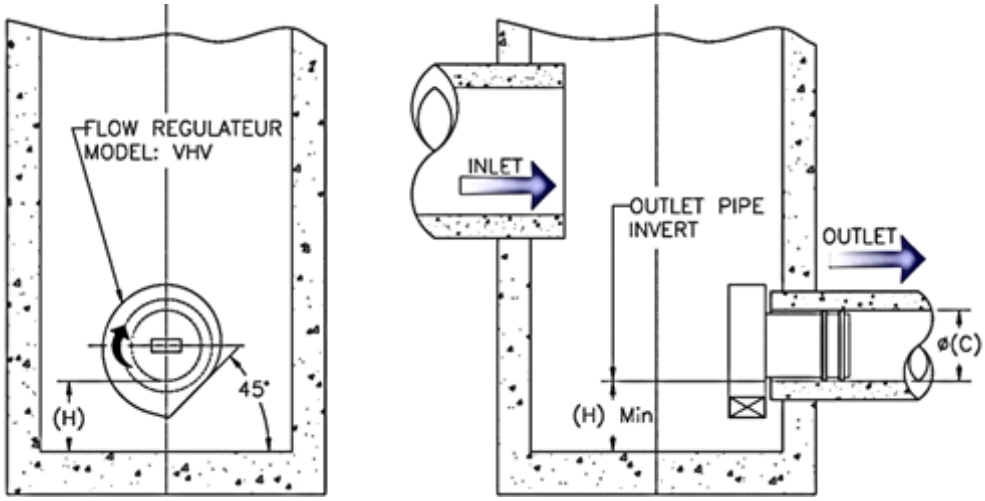


RATING CURVE



Q (L/s)	h (m)
0.000	0.052
2.562	0.119
5.726	0.185
7.342	0.252
8.386	0.319
6.831	0.385
6.976	0.452
11.137	1.118
14.196	1.785
16.706	2.451
18.883	3.118
20.835	3.784
30.499	8.050
39.374	13.382

TYPICAL INSTALLATION



SPECIFICATIONS

The regulator shall be of the static type and shall operate using vortex principles with no moving parts. The flow will be regulated over the entire head range using only the hydraulic properties of the unit and the fluid flowing through it. The regulator shall be self-activating and shall not require instrumentation or external power.

Each regulator is comprised of a vortex chamber where flow control occurs. An outlet sleeve is welded to the vortex chamber to allow the regulator to be installed into a standard outlet pipe. Water tightness shall be obtained using two Neoprene o-rings located on the outlet sleeve and held in place using welded square bars.

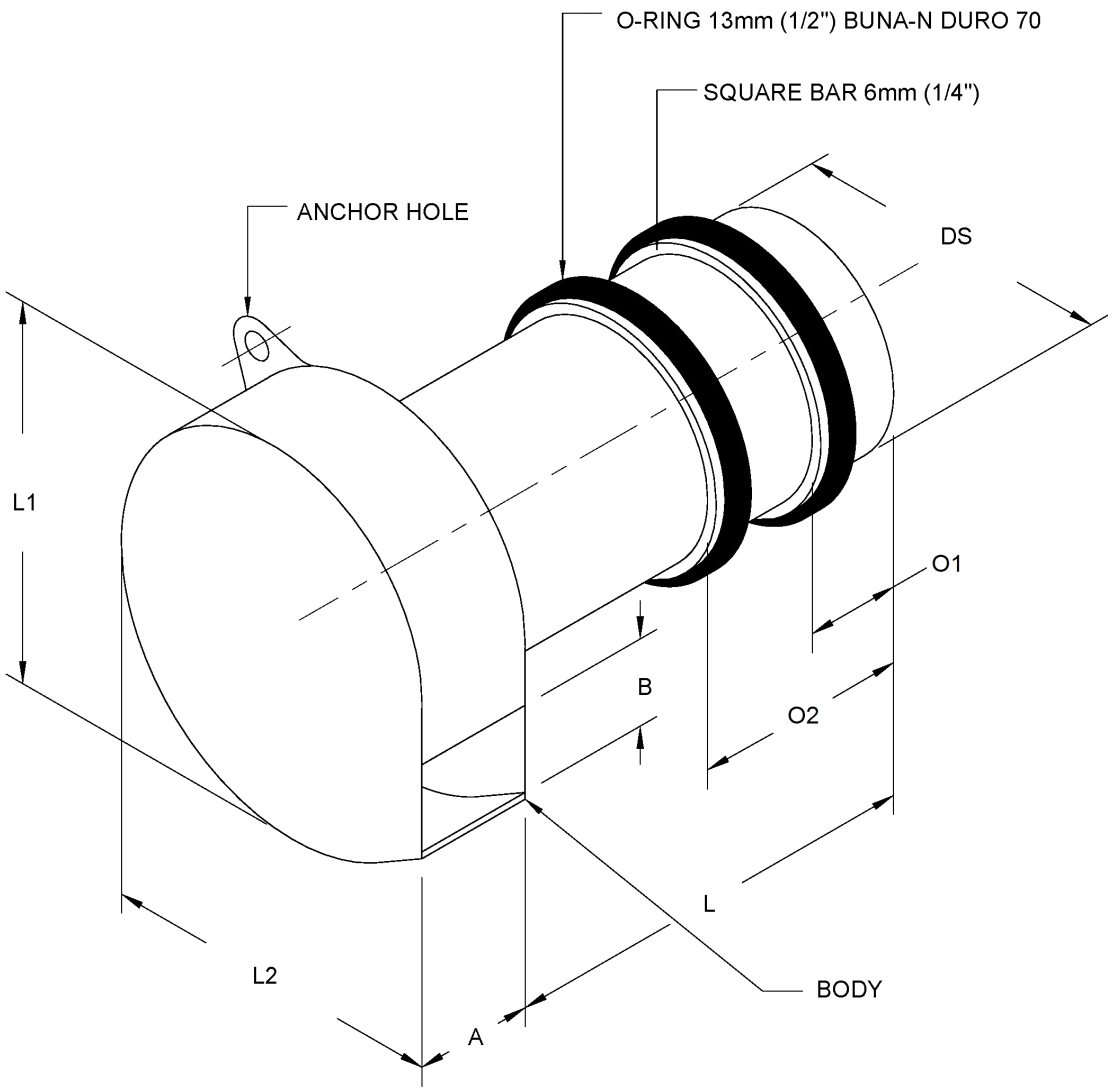
The regulator shall be fabricated entirely of stainless steel type 304 and continuously welded, as manufactured by Veolia Water Technologies Canada Inc. (John Meunier), 514-334-7230, cso@veolia.com.

VEOLIA

HYDROVEX®

Project name:	CITY OF OTTAWA, ON
Project number:	CIMA
Regulator ID:	
Flow rate (Q):	13.33 L/s
Design head (h):	1.58 m
Model:	100 VHV-1,10,STD
Item #:	PRIPHY200281
Quantity:	1

Dimensions	
A	100
B	82
L1	365
L2	328
L	200
DS	225
O1	38
O2	100
Ø VENT	N/A



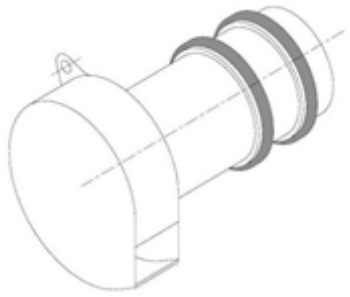
All dimensions in millimeters unless otherwise specified

2019-06-18

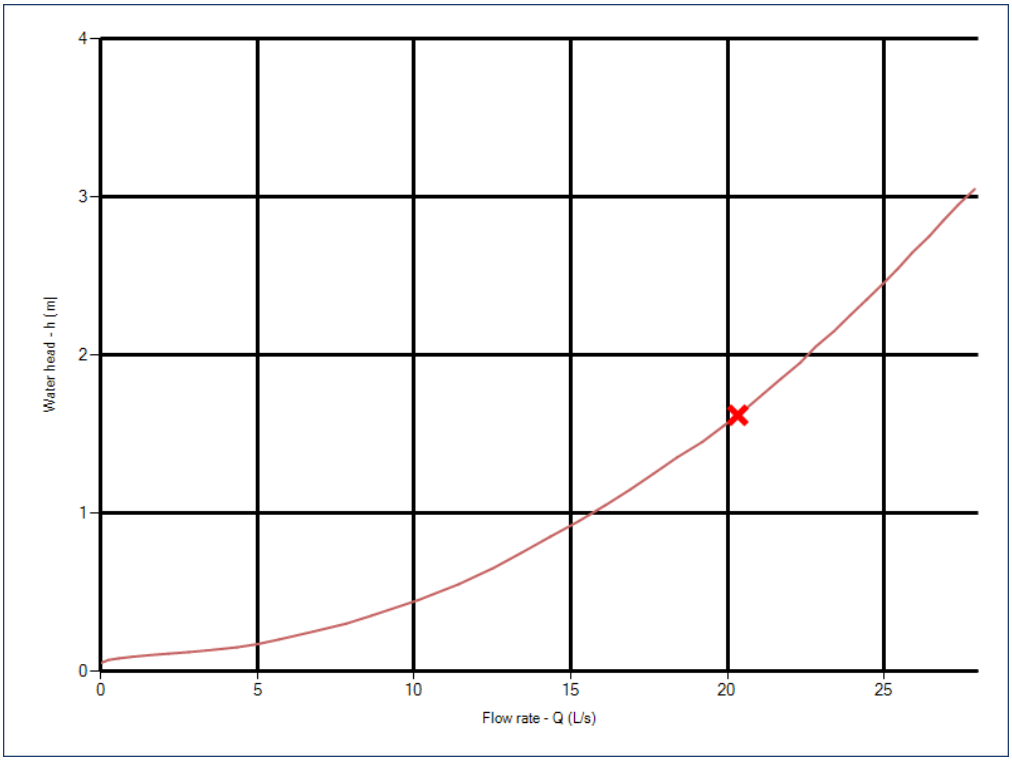
DATA SHEET
HYDROVEX® VHV
VORTEX REGULATOR

GENERAL INFORMATION

Application	Stormwater	
Project name	CITY OF OTTAWA, ON	
Project number	CIMA	
Regulator ID		
Design flow (Q)	20.33	L/s
Design head (h)	1.62	m
Outlet pipe diameter (C)	250	mm
Model	125 VHV-2,10,STD	
item #	PRIPHY200290	
Quantity	1	
Minimum clearance (H)	200	mm
Minimum manhole diameter (B)	900	mm

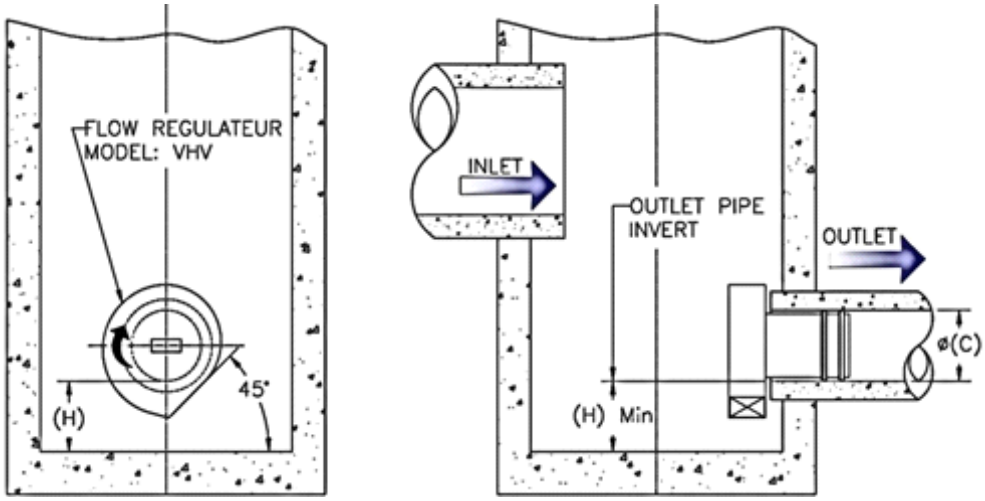


RATING CURVE



Q (L/s)	h (m)
0.000	0.051
0.568	0.081
2.157	0.111
3.867	0.141
5.693	0.201
8.632	0.351
12.512	0.651
15.268	0.951
17.650	1.251
19.868	1.551
21.711	1.851
23.398	2.151
24.961	2.451
26.436	2.751
27.894	3.051
39.448	6.051
40.251	6.301

TYPICAL INSTALLATION



SPECIFICATIONS

The regulator shall be of the static type and shall operate using vortex principles with no moving parts. The flow will be regulated over the entire head range using only the hydraulic properties of the unit and the fluid flowing through it. The regulator shall be self-activating and shall not require instrumentation or external power.

Each regulator is comprised of a vortex chamber where flow control occurs. An outlet sleeve is welded to the vortex chamber to allow the regulator to be installed into a standard outlet pipe. Water tightness shall be obtained using two Neoprene o-rings located on the outlet sleeve and held in place using welded square bars.

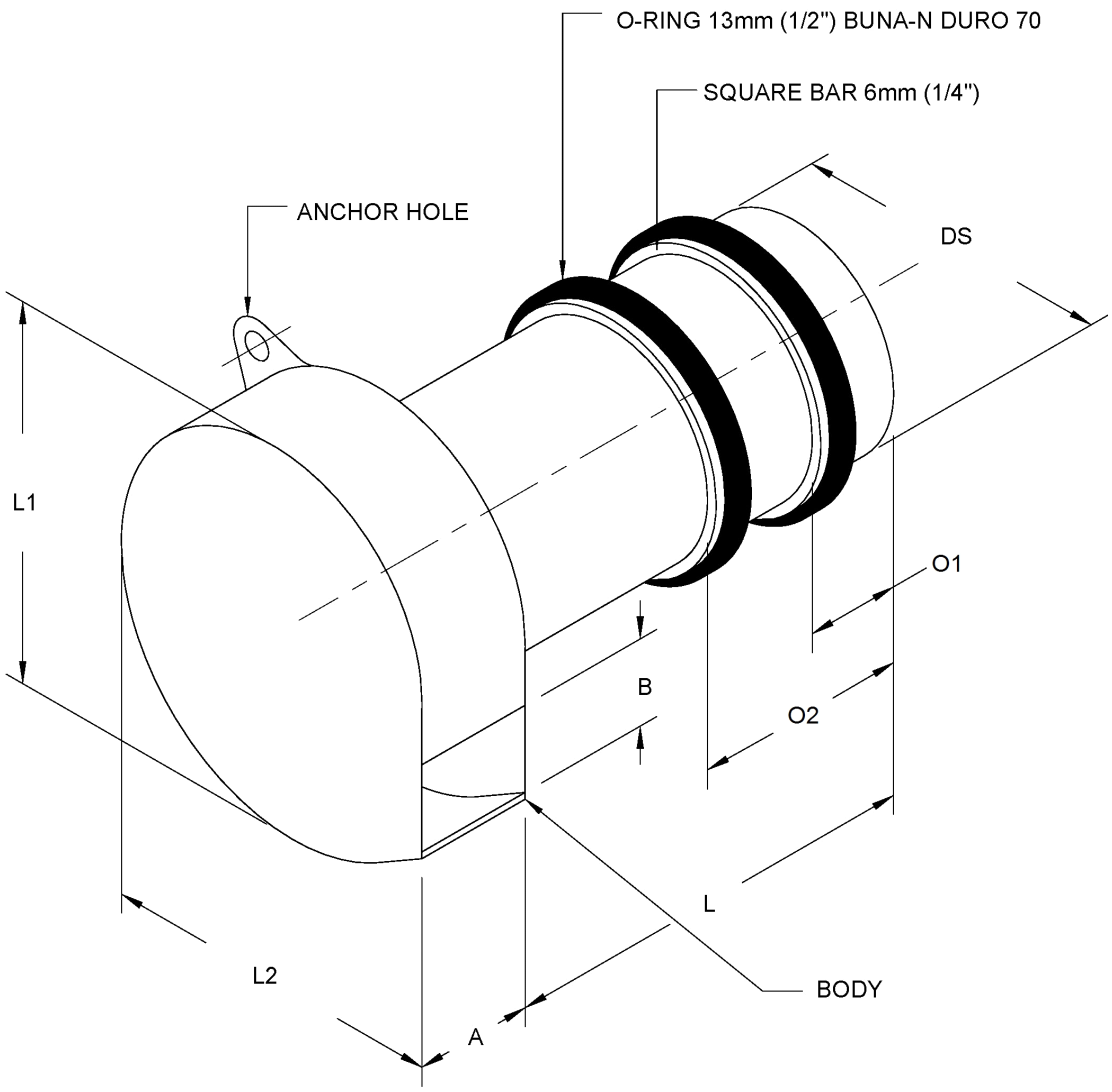
The regulator shall be fabricated entirely of stainless steel type 304 and continuously welded, as manufactured by Veolia Water Technologies Canada Inc. (John Meunier), 514-334-7230, cso@veolia.com.

VEOLIA

HYDROVEX®

Project name:	CITY OF OTTAWA, ON
Project number:	CIMA
Regulator ID:	
Flow rate (Q):	20.33 L/s
Design head (h):	1.62 m
Model:	125 VHV-2,10,STD
Item #:	PRIPHY200290
Quantity:	1

Dimensions	
A	125
B	100
L1	329
L2	287
L	200
DS	225
O1	38
O2	100
Ø VENT	N/A



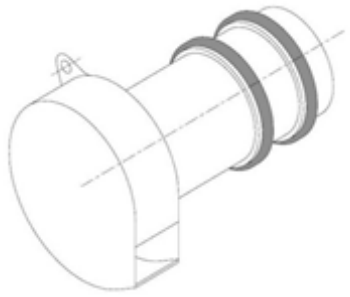
All dimensions in millimeters unless otherwise specified

2019-06-18

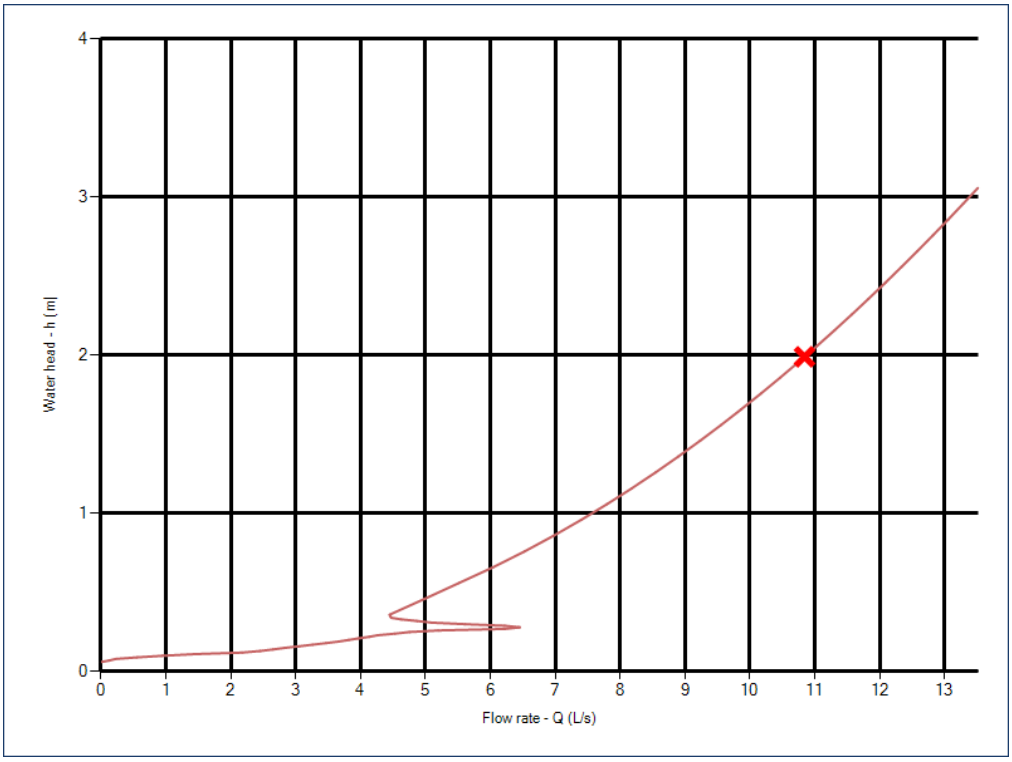
DATA SHEET
HYDROVEX® VHV
VORTEX REGULATOR

GENERAL INFORMATION

Application	Stormwater	
Project name	CITY OF OTTAWA, ON	
Project number	CIMA	
Regulator ID		
Design flow (Q)	10.84	L/s
Design head (h)	1.99	m
Outlet pipe diameter (C)	250	mm
Model	75 VHV-1,10,STD	
item #	PRIPHY200273	
Quantity	1	
Minimum clearance (H)	150	mm
Minimum manhole diameter (B)	600	mm

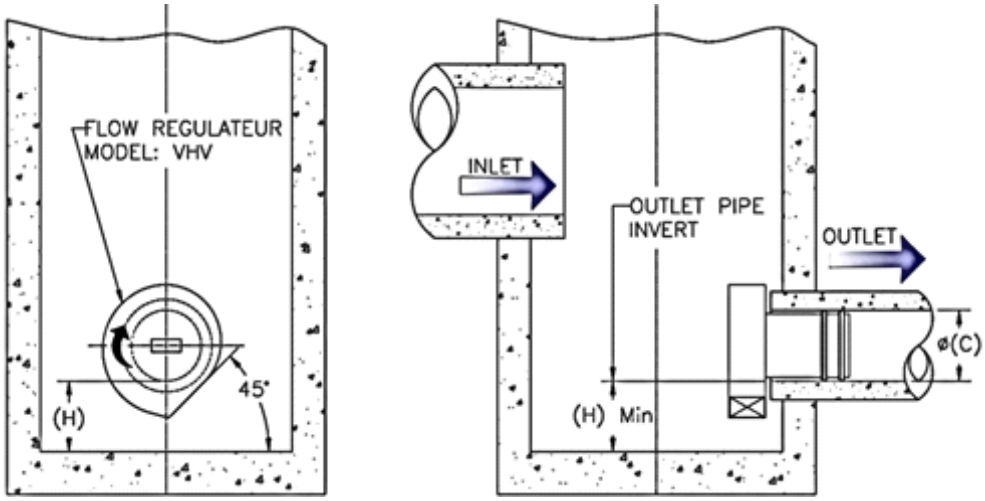


RATING CURVE



Q (L/s)	h (m)
0.000	0.058
1.433	0.108
3.051	0.158
3.967	0.208
5.197	0.258
5.090	0.308
4.449	0.358
6.976	0.858
8.892	1.358
10.464	1.858
11.828	2.358
13.051	2.858
19.104	6.058
24.663	10.058

TYPICAL INSTALLATION



SPECIFICATIONS

The regulator shall be of the static type and shall operate using vortex principles with no moving parts. The flow will be regulated over the entire head range using only the hydraulic properties of the unit and the fluid flowing through it. The regulator shall be self-activating and shall not require instrumentation or external power.

Each regulator is comprised of a vortex chamber where flow control occurs. An outlet sleeve is welded to the vortex chamber to allow the regulator to be installed into a standard outlet pipe. Water tightness shall be obtained using two Neoprene o-rings located on the outlet sleeve and held in place using welded square bars.

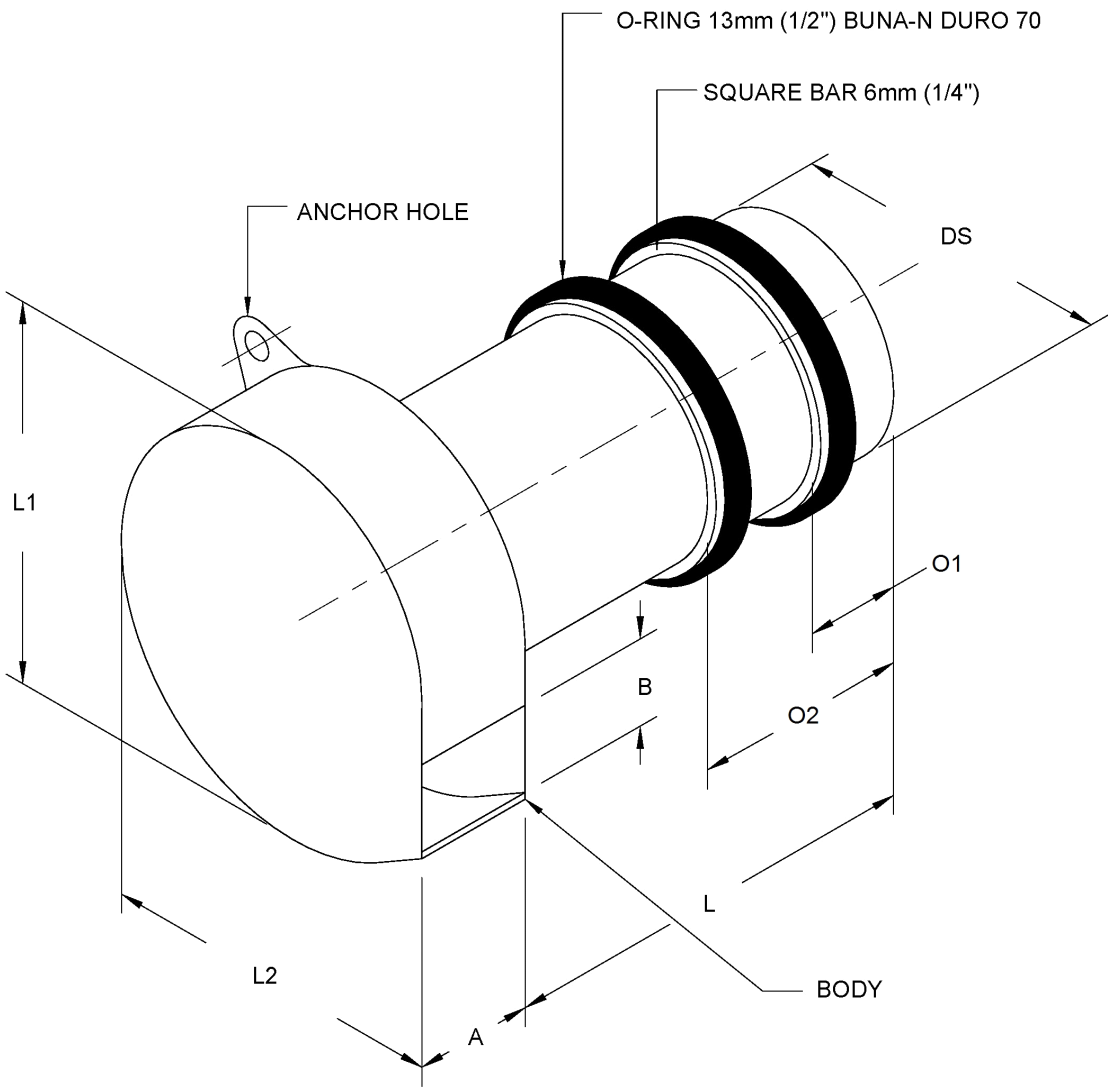
The regulator shall be fabricated entirely of stainless steel type 304 and continuously welded, as manufactured by Veolia Water Technologies Canada Inc. (John Meunier), 514-334-7230, cso@veolia.com.

VEOLIA

HYDROVEX®

Project name:	CITY OF OTTAWA, ON
Project number:	CIMA
Regulator ID:	
Flow rate (Q):	10.84 L/s
Design head (h):	1.99 m
Model:	75 VHV-1,10,STD
Item #:	PRIPHY200273
Quantity:	1

Dimensions	
A	75
B	62
L1	272
L2	246
L	200
DS	225
O1	38
O2	100
Ø VENT	N/A



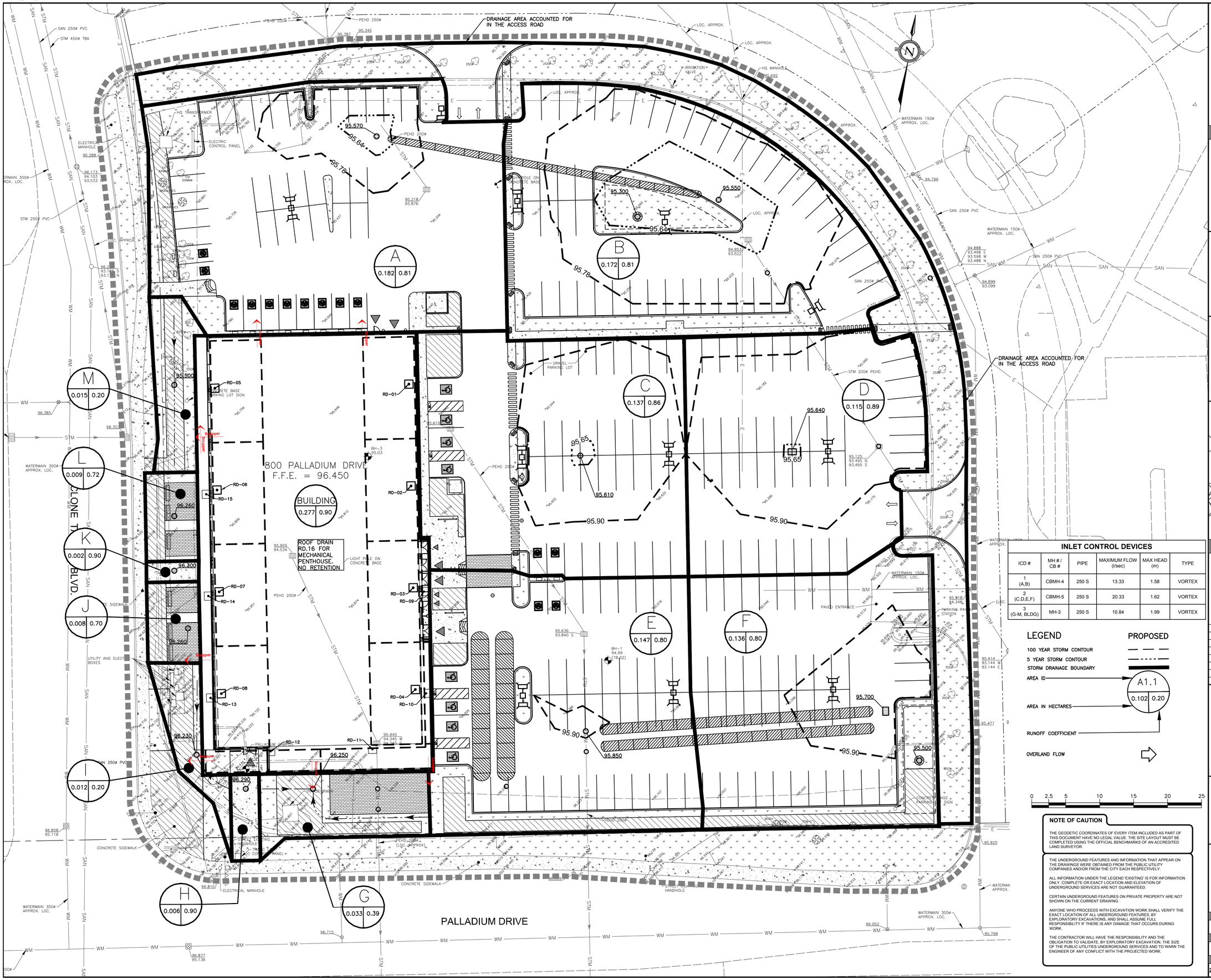
All dimensions in millimeters unless otherwise specified

2019-06-18

F

Appendix F -
Storm Water Management Plan

STGM_CART_A1RFA (841 x 594)



INLET CONTROL DEVICES					
ICD #	MH # / CB #	PIPE	MAXIMUM FLOW (l/sec)	MAX HEAD (m)	TYPE
1 (A,B)	CBMH-4	250 S	13.33	1.58	VORTEX
2 (C,D,E,F)	CBMH-5	250 S	20.33	1.62	VORTEX
3 (G-M, BLDG)	MH-3	250 S	10.84	1.99	VORTEX

LEGEND — PROPOSED

- 100 YEAR STORM CONTOUR
- 5 YEAR STORM CONTOUR
- STORM DRAINAGE BOUNDARY
- AREA ID (A1.1)
- AREA IN HECTARES (0.102 / 0.20)
- RUNOFF COEFFICIENT
- OVERLAND FLOW

0 2.5 5 10 15 20 25

NOTE OF CAUTION

THE GEODETIC COORDINATES OF EVERY ITEM INCLUDED AS PART OF THIS DOCUMENT HAVE NO LEGAL VALUE. THE SITE LAYOUT MUST BE COMPLETED USING THE OFFICIAL BENCHMARKS OF AN ACCREDITED LAND SURVEYOR.

THE UNDERGROUND FEATURES AND INFORMATION THAT APPEAR ON THE DRAWINGS WERE OBTAINED FROM THE PUBLIC UTILITY COMPANIES AND/OR FROM THE CITY EACH RESPECTIVELY.

ALL INFORMATION UNDER THE LEGEND 'EXISTING' IS FOR INFORMATION ONLY. COMPLETE OR EXACT LOCATION AND ELEVATION OF UNDERGROUND SERVICES ARE NOT GUARANTEED.

CERTAIN UNDERGROUND FEATURES ON PRIVATE PROPERTY ARE NOT SHOWN ON THE CURRENT DRAWING.

ANYONE WHO PROCEEDS WITH EXCAVATION WORK SHALL VERIFY THE EXACT LOCATION OF ALL UNDERGROUND FEATURES, BY EXPLORATORY EXCAVATIONS, AND SHALL ASSUME FULL RESPONSIBILITY IF THERE IS ANY DAMAGE THAT OCCURS DURING WORK.

THE CONTRACTOR WILL HAVE THE RESPONSIBILITY AND THE OBLIGATION TO VALIDATE, BY EXPLORATORY EXCAVATION, THE SIZE OF THE PUBLIC UTILITIES UNDERGROUND SERVICES AND TO WARN THE ENGINEER OF ANY CONFLICT WITH THE PROJECTED WORK.

Cominar

PROFESSIONAL ADVISORS

Architecture :

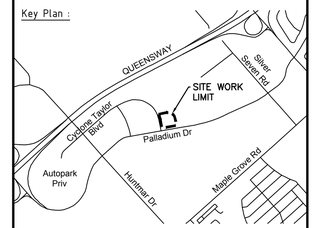
stgm architectes

Structure / Civil :

CIMA+

Mechanical / Electricity :

Key Plan :



REVISIONS

No	yy/mm/dd	Description	By
7	2019/06/17	SITE PLAN CONTROL 3rd ROUND - RESPONSES	B.T.
6	2019/06/12	SITE PLAN CONTROL 2nd ROUND - RESPONSES	B.T.
5	2019/05/28	FOR TENDER REVISION 1	B.T.
4	2019/05/28	SITE PLAN CONTROL 1st ROUND - RESPONSES	B.T.
3	2019/05/17	FOR TENDER	B.T.
2	2019/04/16	FOR PERMIT	B.T.
1	2019/03/08	FOR SITE PLAN APPROVAL	B.T.

Stamps :

Project :

OFFICE DEVELOPMENT
800 PALLADIUM DR.

Drawing :

STORMWATER MANAGEMENT PLAN

Designed By :	Drawn By :		
BENJAMIN TARDIOLI	JONATHAN HAMEL		
Approved By :	File name .DWG		Scale :
C.L-L.	SWM.DWG		1:250
Date :	Project Number :	Sheet :	Number :
2019/03/08	A000919	SWM	

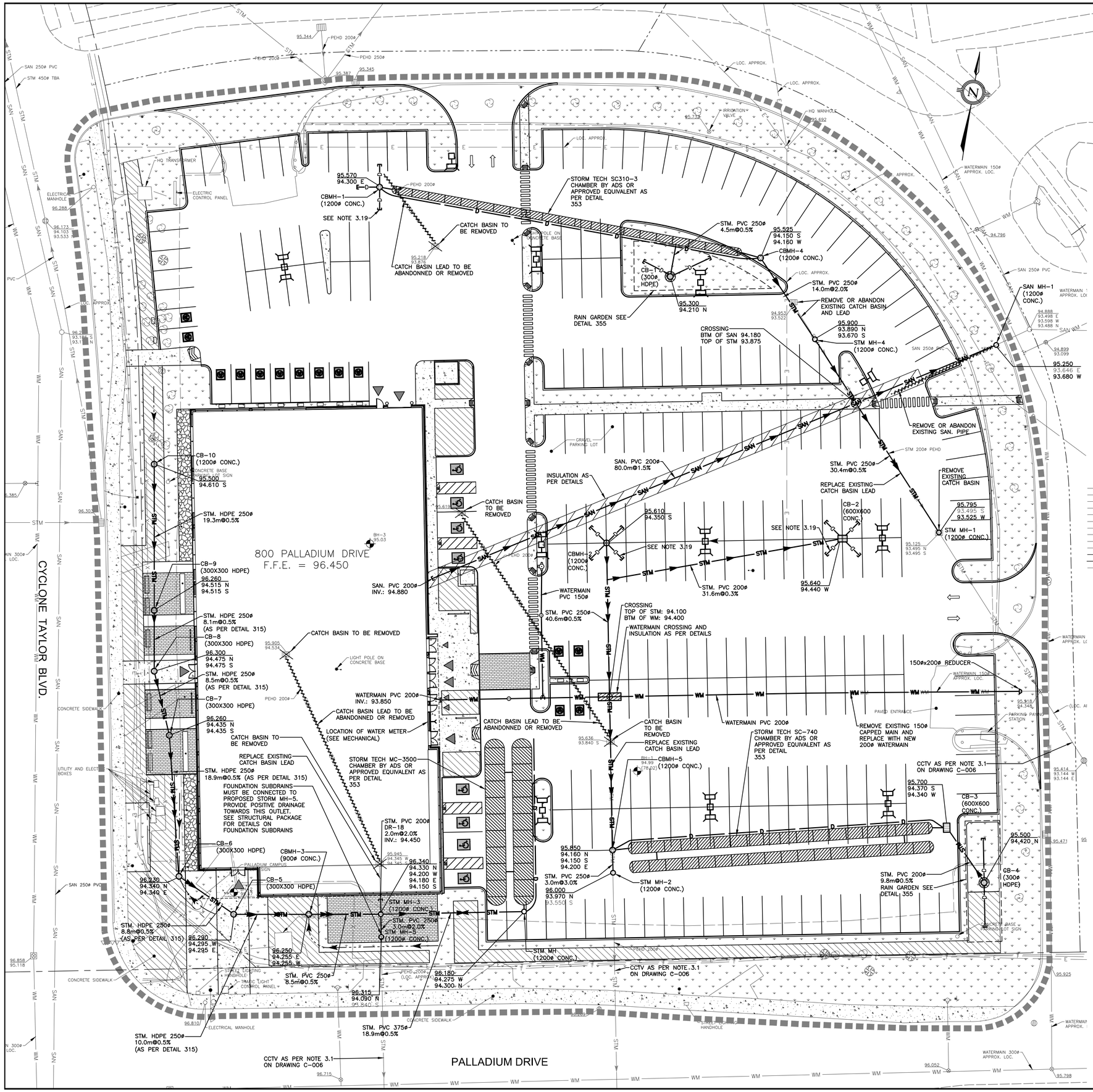
PLAN No. 17904

007-12-19-0045

G

Appendix G -
Site Servicing Plan

STGM_CART_A1RFA (841 x 594)



WATERMAIN		
FINISHED GRADE	TOP OF WATERMAIN	ITEM
96.000	93.550	REDUCER
96.000	94.600	CROSSING OVER 250MM STORM SEWER
96.040	93.640	FIRE HYDRANT LEAD 'T' JOINT
96.000	93.500	FIRE HYDRANT
96.440	94.050	END CAP

INLET CONTROL DEVICES					
ICD #	MH # / CB #	PIPE	MAXIMUM FLOW (l/sec)	MAX HEAD (m)	TYPE
1	CBMH-4	250 S	13.33	1.58	VORTEX
2	CBMH-5	250 S	20.33	1.62	VORTEX
3	MH-3	250 S	10.84	1.99	VORTEX

NOTES:

1. ICD TYPE "VORTEX" SHALL BE TYPE HYDROVEX FROM JOHN MEUNIER OR APPROVED EQUIVALENT.
2. ICD TYPE "ORIFICE CAP" SHALL BE BY IPEX OR APPROVED EQUIVALENT.
3. THE MAXIMUM RELEASE FLOW FOR THE ENTIRE PROJECT IS BASED ON A RELEASE RATE OF 44.5 L/s FOR THE SITE.
4. THE REQUIRED STORAGE ON ROOF IS 57.55 m³.

EXISTING	LEGEND	PROPOSED
WM	WATERMAIN	WM
SAN	SANITARY SEWER	SAN
STM	STORM SEWER	STM
D	PERFORATED SUBDRAIN	D
G	GAS LINE (APPROX. LOC.)	
T	UNDERGROUND TELEPHONE	
CA	UNDERGROUND CABLE (APPROX. LOC.)	
X X	FENCE	
E	UNDERGROUND ELECTRICITY	
OH	OVERHEAD WIRES	
	PROPERTY LINE	
	RIGHT-OF-WAY LIMITS	
	EASEMENT	
	CATCHBASIN	
	MANHOLE	
	CATCHBASIN MANHOLE	
	HDPE CATCHBASIN	
	FIRE HYDRANT	
	VALVE	
	REDUCER	
	TEE	
	SIGN	
	STOP SIGN	
	ELECTRICITY POLE	
	TELEPHONE POLE	
	LIGHT POLE	
	ELECT.-TEL.-STREET LIGHT POLE	
	ELECT.-TEL.-TRANSFORMER POLE	
	PRIVATE STREET LIGHT	
	ELECTRICITY MANHOLE	
	TELEPHONE MANHOLE	
	SURVEY STATION	
	ELEVATION	
	BOREHOLE LOCATION	
	WORK LIMIT	
	DITCH	
	FINISHED FLOOR ELEVATION	F.F.E.
	REMOVE SEWER	
	REMOVE STRUCTURE	
	LIGHT POLE	
	SEWER STRUCTURE TOP ELEVATION AND PIPE INVERTS	TOP ELEVATION PIPE INVERT (N) PIPE INVERT (S) PIPE INVERT (E) PIPE INVERT (W)

NOTE OF CAUTION

THE GEODETIC COORDINATES OF EVERY ITEM INCLUDED AS PART OF THIS DOCUMENT HAVE NO LEGAL VALUE. THE SITE LAYOUT MUST BE COMPLETED USING THE OFFICIAL BENCHMARKS OF AN ACCREDITED LAND SURVEYOR.

THE UNDERGROUND FEATURES AND INFORMATION THAT APPEAR ON THE DRAWINGS WERE OBTAINED FROM THE PUBLIC UTILITY COMPANIES AND/OR FROM THE CITY EACH RESPECTIVELY.

ALL INFORMATION UNDER THE LEGEND 'EXISTING' IS FOR INFORMATION ONLY. COMPLETE OR EXACT LOCATION AND ELEVATION OF UNDERGROUND SERVICES ARE NOT GUARANTEED.

CERTAIN UNDERGROUND FEATURES ON PRIVATE PROPERTY ARE NOT SHOWN ON THE CURRENT DRAWING.

ANYONE WHO PROCEEDS WITH EXCAVATION WORK SHALL VERIFY THE EXACT LOCATION OF ALL UNDERGROUND FEATURES, BY EXPLORATORY EXCAVATIONS, AND SHALL ASSUME FULL RESPONSIBILITY IF THERE IS ANY DAMAGE THAT OCCURS DURING WORK.

THE CONTRACTOR WILL HAVE THE RESPONSIBILITY AND THE OBLIGATION TO VALIDATE, BY EXPLORATORY EXCAVATION, THE SIZE OF THE PUBLIC UTILITIES UNDERGROUND SERVICES AND TO WARN THE ENGINEER OF ANY CONFLICT WITH THE PROJECTED WORK.

Cominar

PROFESSIONAL ADVISORS

Architecture :

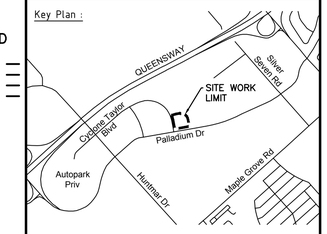
stgm architectes

Structure / Civil :

CIMA+

Mechanical / Electricity :

Key Plan :



REVISIONS

No	yy/mm/dd	Description	By
7	2019/06/17	SITE PLAN CONTROL 3rd ROUND - RESPONSES	B.T.
6	2019/06/12	SITE PLAN CONTROL 2nd ROUND - RESPONSES	B.T.
5	2019/05/28	FOR TENDER REVISION 1	B.T.
4	2019/05/28	SITE PLAN CONTROL 1st ROUND - RESPONSES	B.T.
3	2019/05/17	FOR TENDER	B.T.
2	2019/04/16	FOR PERMIT	B.T.
1	2019/03/08	FOR SITE PLAN APPROVAL	B.T.

Stamps :

LICENSED PROFESSIONAL ENGINEER
C. LAVOIE-LEBEL
100067842
PROVINCE OF ONTARIO

Project :

OFFICE DEVELOPMENT
800 PALLADIUM DR.

Drawing :

SERVICING PLAN

Designed By :	Drawn By :
BENJAMIN TARDIOLI	JONATHAN HAMEL

Approved By :	File name .DWG	Scale :
C.L.-L.	C009 - Servicing Plan.DWG	1:250

Date :	Project Number :	Sheet :	Number :
2019/03/08	A000919	C009	

PLAN No. 17904

007-17-19-0045

H

Appendix H -
Watermain Design Calculations

FPI Cominar
800 Palladium Dr.
A000919 (360)
DOMESTIC (POTABLE) WATER DEMANDS

Institutional / Commercial Design Parameters (Other Commercial):

Base flow:	28000	L/gross ha/day
Gross hectares:	1.39	ha
Daily peak flow factor	1.5	
Hourly peak flow factor	1.8	
Hourly minimum factor	0.5	

WATER DEMANDS

	Average Daily Demand		Maximum Daily Demand		Maximum Hourly Demand		Minimum Hourly Demand	
Office Building	0.45 7.14	l/s galUS/min	0.68 10.71	l/s galUS/min	1.22 19.28	l/s galUS/min	0.23 3.57	l/s galUS/min

Prepared by: Benjamin Tardioli, EIT Date: 2019-02-12

Verified by: Eric Potvin, P.Eng Date: 2019-02-12

* Design parameters from Ottawa Design Guidelines, Water Distribution, 2010

FPI Cominar
800 Palladium Dr.
A000919 (360)
CALCULATION OF FIRE FLOW (FUS METHOD)
(Fire Underwriters Survey, Water Supply for Public Fire Protection - 1999)

1. EVALUATION OF FIRE FLOW (A/B/C/D)

Building area **(B)**	1860	m²	
Number of storeys **(C)**	5		**See note J**
Garage area	0	m²	
Total floor area*	9300	m²	* excluding basements at least 50% below grade
Coefficient for the building **(A)**	0.8		

Coefficient	Construction Type
1.50	Class 1 - Wood frame construction (structure essentially all combustible)
1.00	Class 2 - Ordinary construction (brick or other masonry walls, combustible floor and interior)
0.80	Class 3/4 - Non-combustible construction (unprotected metal structural components, masonry or metal walls)
0.60	Class 5/6 - Fire-resistive construction (fully protected frame, floors, roof)

Fire flow **(D)** 17000 litre/min

$D = 220\ C\ \sqrt{S}$

*For one family and two family dwellings not exceeding two storeys in height, see Note J

2. INCREASE BY ASSIGNMENT (E)

assignment of low or high fire hazard occupancy **(E)** 0.85

Coefficient	Assignment
1.25	Rapid burning or flash burning
1.15	Free burning
1.00	Combustible
0.85	Limited combustible
0.75	Non-combustible

Fire flow 14450 litre/min

The fire flow determined shall not be less than 2000L/min

* See Appendix tab for assignment of occupancy

3. BUILDING PROTECTED BY SPRINKLERS (F)

Sprinkler system meeting NFPA 13 = 30% reduction	yes	10115	litre/min
+ If water supply is standard for both the system and fire department hose lines = Add 10% reduction	yes	8670	litre/min
+ If the flow sensors and valves are connected to a recognized monitoring service = Add 10% reduction	yes	7225	litre/min

Fire flow 7225 litre/min

FPI Cominar
800 Palladium Dr.
A000919 (360)
CALCULATION OF FIRE FLOW (FUS METHOD)
(Fire Underwriters Survey, Water Supply for Public Fire Protection - 1999)

4. INCREASE BASED ON SEPARATION OF BUILDINGS (G)

Building on the north side	1
Building on the east side	1
Building on the west side	1
Building on the south side	1

All buildings greater than 50m away

Coefficient	Separation
1.25	0 to 3 m
1.20	3.1 to 10m
1.15	10.1 to 20m
1.10	20.1 to 30m
1.05	30.1 to 45m
1.00	no buildings
1.10	firewall

0%

Fire Flow 7225 litre/min

* The fire flow shall not exceed 45,000 L/min nor be less than 2,000 L/min

Required fire flow (H) **7000** **l/min** * final figure customarily rounded to nearest 1000 l/min

116.7 l/s

1540 gal/min Use of fire hydrants with a full face diameter

1849 gal US/min depending on the municipality

Prepared by: Benjamin Tardioli, EIT Date: 2019-02-12

Verified by: Eric Potvin, P.Eng Date: 2019-02-12

PEO # 100208490

BOUNDARY CONDITIONS

Boundary Conditions For: 800 Palladium Dr.

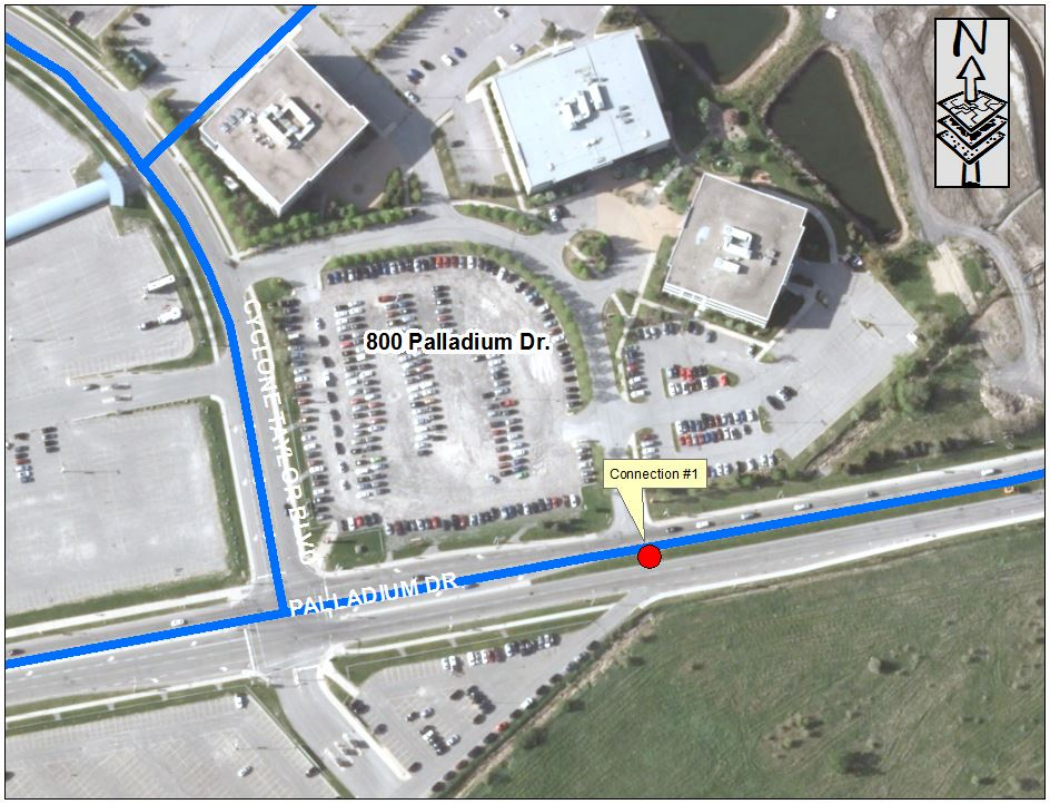
Date of Boundary Conditions: 2019-Feb-14

Provided Information:

Scenario	Demand	
	L/min	L/s
Average Daily Demand	18	0.3
Maximum Daily Demand	27	0.5
Peak Hour	49	0.8
Fire Flow #1 Demand	7,000	116.7

Number Of Connections: 1

Location:



BOUNDARY CONDITIONS

Results:

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	162.0	93.8
Peak Hour	157.4	87.3
Max Day Plus Fire (7,000) L/min	158.8	89.4

[1]Elevation: **95.970 m**

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

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

FPI Cominar
800 Palladium Dr.
A000919 (360)
CALCULATION OF LOSSES IN CLOSED SYSTEM

PIPE CHARACTERISTICS:

LENGTH:	**50 m**
DIAMETER	**150 mm**

PRESSURE LOSS/GAIN DUE TO FRICTION (HAZEN-WILLIAMS EQUATION):

	FLOW (l/s)	CHW	LOSSES (m) 100	VELOCITY (m/s)	V2/2g (m)
Max Day	**0.68**		0.001	0.04	0.000
Peak Hour	**1.22**		0.004	0.07	0.000
Max Day + FF	**117.35**		20.556	6.64	2.248

PRESSURE LOSS/GAIN DUE TO CHANGE IN ELEVATION (HEAD LOSS/GAIN):

Elevation at the point of connection:	**95.970 m**	
Elevation at the point of fire flow:	**95.200 m**	
	0.770 m	**GAIN**

TOTAL LOSS (Friction Loss + Head Loss) = **19.79 m**

Prepared by: Benjamin Tardioli EIT Date: 3/6/2019

Verified by: Tim Kennedy, P.Eng. Date: 3/6/2019

FPI Cominar
800 Palladium Dr.
A000919 (360)
CALCULATION OF LOSSES IN CLOSED SYSTEM

PIPE CHARACTERISTICS:

LENGTH:	**80 m**
DIAMETER	**200 mm**

PRESSURE LOSS/GAIN DUE TO FRICTION (HAZEN-WILLIAMS EQUATION):

	FLOW (l/s)	CHW	LOSSES (m) 110	VELOCITY (m/s)	V2/2g (m)
Max Day	**0.68**		0.000	0.02	0.000
Peak Hour	**1.22**		0.001	0.04	0.000
Max Day + FF	**117.35**		6.789	3.74	0.711

PRESSURE LOSS/GAIN DUE TO CHANGE IN ELEVATION (HEAD LOSS/GAIN):

Elevation at the point of connection:	**95.200 m**	
Elevation at the point of fire flow:	**96.250 m**	
	-1.050 m	**LOSS**

TOTAL LOSS (Friction Loss + Head Loss) = **7.84 m**

Prepared by: Benjamin Tardioli EIT Date: 3/6/2019

Verified by: Tim Kennedy, P.Eng. Date: 3/6/2019

Appendix I -
Sanitary Sewer Peak Flow Calculations

HYDRAULIC CALCULATIONS FOR SANITARY SEWERS

PROJECT: 800 Palladium
FILE NO.: A000919

Manning Roughness Coefficient : 0.013
Maximum Allowable Velocity : 3.00 m/s
Minimum Allowable Velocity : 0.60 m/s

Section	Diametre	Length	Slope	Capacity (full)	Velocity (full)	Sanitary Flow	Velocity (estimated)	Error Message			% Full
								Flow Velocity		Pipe Capacity	
	mm	m	%	m³/s	m/s	m³/s	m/s	maximum	minimum		
Bulding to MH1	200	80.7	1.50%	0.040	1.28	0.00135	0.58	O.K.	increase velocity	O.K.	3%
MH1 to existing MH	200	4.9	1.00%	0.033	1.04	0.00135	0.50	O.K.	increase velocity	O.K.	4%

Prepared by: Benjamin Tardioli, EIT Date: May 27, 2019

Verified by: Tim Kennedy, P.Eng Date: May 27, 2019

800 PALLADIUM DRIVE
A000919 (360)

SANITARY SEWER FLOWS - COMMERCIAL & INSTITUTIONAL SECTORS

Base Flow: 50,000 L/gross ha/day
Peaking factor: 1.5 [ref. to peaking factors table]
Infiltration: 0.33 L/s/effective gross ha (for all areas)

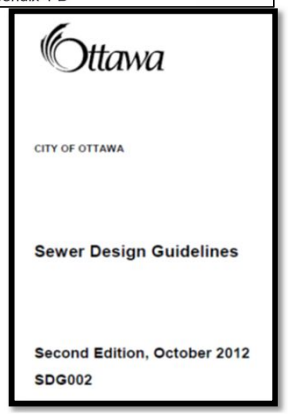
Harmon Equation:

$$P.F. = 1 + \left(\frac{14}{4 + \left(\frac{P}{1000} \right)^{\frac{1}{2}}} \right) * K$$

where:
P=Population
K=Correction Factor =0.8

Commercial Peak factor:	1.5 if commercial contribution >20%, otherwise use 1.0
Institutional Peak factor:	1.5 if institutional contribution >20%, otherwise use 1.0
Industrial Peak Factor:	Per Figure in Appendix 4-B

Building	Gross Area	Gross Area	Proportional Area	Average Daily Flow	Peaking Factor	Peak Flow	Extraneous Flow	Maximum Flow
	m²	ha	ha	(L/s)		(L/s)	(L/s)	(L/s)
800 PALLADIUM	13700	1.37	0.48	0.79	1.50	1.19	0.16	1.35
						Qmax - Total (L/s) =		**1.35**



Prepared by: Benjamin Tardioli, EIT
PEO#
Date: 2019-05-27

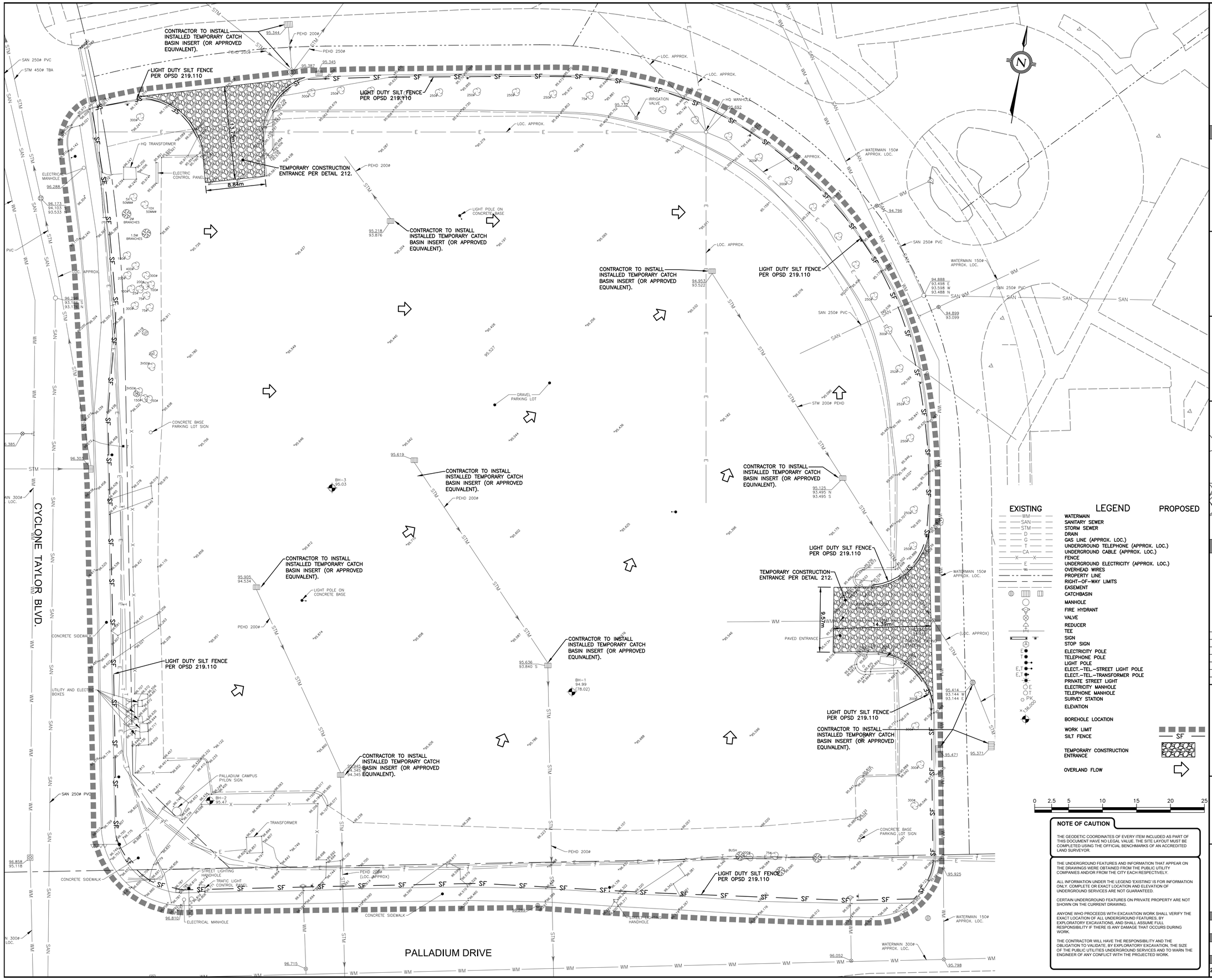
Verified by: Tim Kennedy, P.Eng
PEO#
Date: 2019-05-27

#VALUE!

J

Appendix J -
Sediment and Erosion Control and Notes Plans

STGM_CART_A1RFA (841 x 594)



NOTE OF CAUTION

THE GEODETIC COORDINATES OF EVERY ITEM INCLUDED AS PART OF THIS DOCUMENT HAVE NO LEGAL VALUE. THE SITE LAYOUT MUST BE COMPLETED USING THE OFFICIAL BENCHMARKS OF AN ACCREDITED LAND SURVEYOR.

THE UNDERGROUND FEATURES AND INFORMATION THAT APPEAR ON THE DRAWINGS WERE OBTAINED FROM THE PUBLIC UTILITY COMPANIES AND/OR FROM THE CITY EACH RESPECTIVELY.

ALL INFORMATION UNDER THE LEGEND 'EXISTING' IS FOR INFORMATION ONLY. COMPLETE OR EXACT LOCATION AND ELEVATION OF UNDERGROUND SERVICES ARE NOT GUARANTEED.

CERTAIN UNDERGROUND FEATURES ON PRIVATE PROPERTY ARE NOT SHOWN ON THE CURRENT DRAWING.

ANYONE WHO PROCEEDS WITH EXCAVATION WORK SHALL VERIFY THE EXACT LOCATION OF ALL UNDERGROUND FEATURES. BY EXPLORATORY EXCAVATIONS, AND SHALL ASSUME FULL RESPONSIBILITY IF THERE IS ANY DAMAGE THAT OCCURS DURING WORK.

THE CONTRACTOR WILL HAVE THE RESPONSIBILITY AND THE OBLIGATION TO VALIDATE, BY EXPLORATORY EXCAVATION, THE SIZE OF THE PUBLIC UTILITIES UNDERGROUND SERVICES AND TO WARN THE ENGINEER OF ANY CONFLICT WITH THE PROJECTED WORK.

Cominar

PROFESSIONAL ADVISORS

Architecture :

stgmarchitectes

Structure / Civil :

CIMA+

Mechanical / Electricity :

Key Plan :

REVISIONS

No	yy/mm/dd	Description	By
6	2019/06/12	SITE PLAN CONTROL 2nd ROUND - RESPONSES	B.T.
5	2019/05/28	FOR TENDER REVISION 1	B.T.
4	2019/05/28	SITE PLAN CONTROL 1st ROUND - RESPONSES	B.T.
3	2019/05/17	FOR TENDER	B.T.
2	2019/04/16	FOR PERMIT	B.T.
1	2019/03/08	FOR SITE PLAN APPROVAL	B.T.

Stamps :

Project :

OFFICE DEVELOPMENT
800 PALLADIUM DR.

Drawing :

SEDIMENT AND EROSION CONTROL PLAN

Designed By :	Drawn By :
BENJAMIN TARDIOLI	JONATHAN HAMEL

Approved By :	File name .DWG	Scale :
C.L-L.	C004 - Sediment and Erosion Control Plan.DWG	1:250

Date :	Project Number :	Sheet :	Number :
2019/03/08	A000919	C004	

PLAN No. 17904

001-12-11-0045

1. GRADING - GENERAL

1.1. The Contractor must conform to all laws, codes, ordinances, and regulations adopted by federal, provincial or municipal government councils and government agencies, applying to work to be carried out.

1.2. Unless otherwise indicated, all generals conditions, materials and construction methods to be in accordance with the requirements of the latest edition of the Ontario Provincial Standard Specifications and Drawings (OPSS and OPSD). Furthermore the requirements of the the Ontario Ministry of the Environment, Conservation and Parks (MECP), the Ontario Ministry of Natural Resources and Forestry (MNRF), applicable Conservation Authorities, the municipal standard specifications and drawings, and all other governing authorities must be adhered to as they apply.

1.3. Wherever standards, laws and/or regulations are mentioned they refer to their current versions, modifications included.

1.4. The boreholes and test pits shown on the plan are for information purposes only. Their location on the plan is approximate. The Contractor shall refer to the boreholes and test pit records to obtain information about observed stratigraphy on site.

1.5. Contractor is responsible for obtaining all permits required to complete all works and bear cost of same, including but not limited to road cut permit, sewer discharge permit, Permit to Take Water/EASR, etc. and their associated costs.

1.6. The Contractor is responsible for the coordination of his activities with others on-site.

1.7. The location of existing underground municipal services and public utilities as shown on the plans are approximate. The Contractor must determine the exact location, size, material and elevation of all existing utilities (on-site and off-site) prior to any excavation work. Damage to any existing services and/or existing utilities during construction, whether or not shown on the drawings must be repaired by the Contractor at his own expense.

1.8. Site preparation includes clearing, grubbing, stripping of topsoil, demolition, removal of unsuitable materials, cut, fill and rough grading of all areas to receive finished surfaces.

1.9. All material shall be compacted as per the requirements of the governing authority and be approved by the Consultant prior to delivery to the site.

1.10. Compaction shall conform to the following requirements:

Exposed subgrade:
95% Standard Proctor maximum dry density (SPMDD)
Granular foundations:
98% Standard Proctor maximum dry density (SPMDD)
Asphalt Pavement (Performance Graded (PG) 58-34 asphalt cement):
As per OPSS 310
Subgrade fill (pavement areas - Either acceptable fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill):
95% Standard Proctor Maximum Dry Density (SPMDD)
Structural fill (building and light standard footprints OPSS Granular 'A' or Granular 'B' Type II Material):
98% Standard Proctor Maximum Dry Density (SPMDD)

1.11. If groundwater is encountered during construction, dewatering of excavations could be required as per OPSS 518. It is assumed that groundwater may be controlled by sump and pumping methods. As required under the "Ontario Water Resources Act (OWRA)", the Contractor must register all water taking activities on Ontario's "Environmental Activity and Sector Registry (EASR)" if water taking exceeds 50,000 l/day, and obtain a "Permit to Take Water (PTTW)" if water taking exceeds 400,000 l/day.

1.12. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements and as follows:

1.12.1. Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials to within the required parameters of the receiving body before discharging to storm sewers, watercourses or drainage areas.

1.12.2. Before discharging to storm sewers, watercourses or drainage areas, discharge water must be sampled and tested to ensure quality requirements in accordance with City of Ottawa Sewer Use By-Law No. 2003-514 and the Ministry of Environment, Conservation and Parks (MECP) are adhered to. The Contractor is to perform all additional sampling and testing as required by City of Ottawa. All associated fees to be paid by the Contractor.

1.12.3. Where water is not suitable for discharge into the adjacent storm sewers, watercourses or drainage areas it must be discharged into the on-site sanitary sewer collection system, or disposed off-site at an approved disposal facility.

a. When discharging to the sanitary sewer the Contractor must obtain a Sanitary Sewer Agreement for Dewatering from the City of Ottawa in accordance with City of Ottawa Sewer Use By-Law No. 2003-514 and pay all associated fees.

- A copy of the signed Sanitary Sewer Agreement for Dewatering must be provided to the Client Representative in advance of dewatering and discharge.
- The Contractor must ensure all requirements of the Discharge Agreement are adhered to and all prerequisite requirements of the Agreement are in place prior to commencing dewatering.
- Provide flow meter and record discharge rate in accordance with City of Ottawa requirements.
- Dewatering discharge rate to sanitary sewer not to exceed rate specified by City.

b. For off-site disposal of dewatering effluent, Contractor to provide Client Representative proof of receipt that dewatering effluent was received at a licensed landfill facility and pay all associated disposal fees.

- Contractor must provide name of proposed licensed disposal facility to Client Representative in advance of any dewatering waste leaving the site.
- Contractor is responsible for paying all costs associated with any water quality sampling and testing required.

1.13. The Contractor must maintain benchmarks and landmark references as is. Otherwise these references will be repositioned by a certified land surveyor at the Contractor's expense.

1.14. The Contractor is the only person in charge of safety on the building site. The Contractor is responsible for providing adequate protection of the workers, other personnel and the general public, protection of materials, as well as maintaining in good condition the completed works and works to be completed.

The Contractor must supply, install and maintain an appropriate safety fence along the work perimeter until the work is complete.

The Contractor must provide at any time:

- A sufficient number barriers, posters, guards and others to ensure safety;

1.15. Temporary excavations in the overburden must be completed as per the requirements of the Occupational Health and Safety Act (OHSA), O. Reg. 213/91. That is, side slopes must extend 1 horizontal and 1 vertical from the base of the excavation. If excavations extend below the water table then side slopes of 3 horizontal to 1 vertical, or gentler, may be required to maintain stability of the side slopes.

Where these slopes are not practical due to obstacles or space restrictions, shoring must be implemented according to the OHSA, O. Reg. 213/91.

The subsoil at this site is considered to be mainly a Type 2 and Type 3 soil according to the Occupational Health and Safety Ace and Regulations for Construction Projects.

1.16. The Contractor must pace deliveries and removals in order to minimize and control stockpiles.

1.17. Stockpile material must be stored away from excavations at a distance at least equal to the depth of the excavation. Construction traffic should be limited near open excavation.

1.18. Cleanliness on the site:

- The Contractor shall clean roadways at his own cost as directed by the Client representative;
- All site roads and walkways to and from the construction zone must be kept clean at all times, from mud, dirt, granular material, debris, etc.;
- The Contractor must leave work area clean at end of each day;
- Materials and equipment must be laid out in an organized and safe manner;
- All material, equipment and temporary structures which are no longer necessary for the execution of the Contract must be removed from the site;
- If required the Contractor must use screens, bulkheads, or any other recognized means in order to reduce noise, dust, interference, obstruction, etc., in conformity with the requirements of the provincial and municipal authorities having jurisdiction.

1.19. During the construction period the Contractor is responsible for installing and maintaining temporary traffic signage, including traffic signs, traffic markings and temporary traffic lights, and flagmen, as required by the Client, the Consultant, the Municipality, the MTO, and other governing authorities.

1.20. The Contractor must control surface runoff from precipitation during construction.

1.21. The Contractor must ensure the following mitigation measures are implemented in order to reduce the risk of ground contamination from petroleum products:

- The list of persons and agencies to contact in the event of an emergency must be posted in plain sight on the work site for the duration of the construction period;
- Machinery must be clean and kept clean to limit any grease or oil deposits inside the work area;
- Frequent inspections must be performed to detect any oil, fuel, grease or other leaks. If a leak is detected, the necessary corrective action must be taken immediately;
- An emergency kit for the recovery of petroleum products must be kept on site at all times. The kit must include at least 30 m of absorbent booms, a box of absorbent pads and solid absorbent material (powder or granules). The kit must be stored near the location of work and machinery, and kept within easy reach at all times to ensure a rapid response;
- In the event of a spill the Contractor must immediately report to the Spills Action Centre of the Ministry of Environment, Climate and Parks at 1-800-268-6060. Hydrocarbons and contaminated soils will be recovered by a specialized firm.

1.22. The Contractor must ensure the following measures are implemented regarding the handling of concrete:

- Concrete should either be mixed away from the site or should be prepared on paved surfaces if only small quantities are required (i.e. minor repairs);
- Excess concrete must be disposed off-site at a location that meets all regulatory requirements;
- The washing of concrete trucks and other equipment used for mixing concrete should not be carried out within 30 m of a watercourse or wetland and should take place outside of the work site;
- All concrete trucks should collect their wash water and recycle it back into their trucks for disposal off-site at a location meeting all regulatory requirements.

2. SEDIMENT AND EROSION CONTROL

2.1. Specifically, sediment and erosion control measures to be constructed as per OPSS 805.

2.2. The Contractor must implement best management practices and provide adequate sediment and erosion control measures during construction in order to:

- Prevent soil erosion which can result from stormwater runoff or wind erosion during construction;
- Prevent sediment deposits in the storm sewer and/or collecting streams and;
- Prevent air pollution from dust and particulate matter.

2.3. Provisions must be made for sediment and erosion control measures prior to stripping the site of vegetation and other deleterious materials. Measures such as phase stripping, vegetation buffer zones, silt fences, straw bales, sediment traps/basins, rock checks, etc. must be constructed and maintained in order to control sediment, as required by the provincial and municipal governing authorities.

2.4. The Contractor must set up the measures indicated in/on the plan, inspect them frequently, particularly following rainfalls events, and clean and repair or replace the deteriorated structures.

2.5. When the sediment and erosion control measures must be removed in order to complete a portion of the work, these same measures must be reinstated.

2.6. When storing soil on site in piles the Contractor must cover each pile with tarps, straw or a geotextile fabric to avoid fine particle transport by wind and/or streaming rain water.

2.7. During the construction period, catchbasin inserts must be installed and maintained between the frame and cover of all catchbasins and catchbasin/manholes to minimize sediments entering the storm sewer system. All landscaping areas must be completed prior to the removal of the inserts.

2.8. The light duty silt fence barrier must be installed as per OPSD 219.110.

2.9. At all times the Contractor must maintain the municipal access roads clean and free of sediments. When cleaning the access roads, the Contractor must take the necessary precautions to clear the surfaces covered with sediment prior to cleaning with water.

2.10. For dust control, Contractor to apply calcium chloride (Type L - OPSS 2501 and CAN/CGSB-15-1) and water with equipment approved by the Client representative at rate in accordance to OPSS 506 when directed by the Client representative.

2.11. At the end of the construction period, the Contractor is responsible for removal of the temporary sediment and erosion control measures and reconditioning the affected areas.

2.12. This Sediment and Erosion Control Plan is a "Living Document" which may be revised in the event that the control measures are not sufficient.

3. DEMOLITION AND REMOVALS

3.1. The Contractor must visit the premises in order to be fully aware of existing conditions on site, including all elements to be removed and demolished. No claim will be accepted due to a poor evaluation of the work to be completed.

3.2. The Contractor must protect and maintain in service the existing works which must remain in place. If they are damaged, the Contractor must immediately make the replacements and necessary repairs to the satisfaction of the Client representative and without additional expense to the Client.

3.3. The Contractor must carry out necessary saw cuts.

3.4. The Contractor must entirely remove the demolition wreckage from the construction site in accordance with the requirements of the Ministry of Environment, Conservation and Parks (MECP).

- The Contractor must discard recyclable demolition materials in collaboration with a regional recycling company. The Contractor must provide proof to the Client representative that the materials were properly recycled and that the chosen recycling company is recognized in the recycling field.
- All other demolition materials must be disposed off-site at authorized licensed landfills and in conformity with the applicable laws and regulations. The Contractor must be able to provide, upon request, copies of the disposal tickets to the Client representative.

3.5. The Contractor is responsible for locating existing public utilities and (if required) submit a request for the interruption of public utility services, such as gas, telephone, power, cable, sewers, watermain, etc.

3.6. Sewer / watermain pipes to be abandoned must be cut, filled with unshrinkable concrete conforming to OPSS 1359, and capped.

3.7. The Contractor must complete all removals as shown on the drawings and as required to make the work complete.

3.8. All materials, products and others coming from the demolition belong to the Contractor, unless specified otherwise.

3.9. Surfaces and works located outside of the construction work limit must be reinstated as they were before beginning of work.

4. GENERAL SUBGRADE PREPARATION

4.1. Earth removal shall be inspected by an experienced Geotechnical Engineer to ensure that all unsuitable materials are removed prior to the placement of fill, including concrete and/or others, and to confirm the compaction degree and condition of the founding soils. All unsuitable materials must be hauled off site and disposed as per provincial and municipal regulations.

4.2. Subgrade must be approved by experienced geotechnical personnel before proceeding with placement of fill.

4.3. All soft, wet or disturbed areas revealed under surface compaction must be removed to a minimum depth of 500 mm and replaced with compacted suitable subgrade fill (OPSS Granular B Type II) as directed by the Geotechnical Engineer and/or an approved non-woven Class 1 geotextile, as per OPSS 1860. Transition around sub-excavation, where backfill and native material are not of similar nature, shall be sloped at 5 horizontal to 1 vertical, within 1.8 m of finished surface.

4.4. All granular fill must be placed in maximum 300 mm thick loose lifts and compacted using suitable methods as per the requirements.

4.5. All heavy equipment shall not operate directly on the **clay** subgrade. A minimum of 500 mm of fill/granulars shall be used to allow traffic over the underlying clay subgrade. Clay subgrade surfaces will be prone to disturbance by weather and traffic, therefore preparation of the subgrade/granular infrastructure shall be scheduled such that the granular materials are placed as quickly as possible. A lean concrete slab may also be used in lieu of a granular pad to stabilize the subgrade upon approval from the Geotechnical Consultant.

4.6. If contaminated material is encountered during the work, the Contractor must dispose off-site all materials from the contaminated area in accordance with the requirements of the Ontario Ministry of the Environment, Conservation and Parks (MECP). Prior to the start of work the Contractor must provide the name and location of landfill(s) where the contaminated materials will be disposed to the Client Representative. The Contractor must obtain from the landfill Owner documents confirming that he has the right to accept the contaminated material. During the work, the contractor must provide to the Client Representative a copy of all check-in receipts issued by the landfill Owner.

4.7. The Contractor is responsible to provide a confirmation that the imported material used as subgrade fill is free of any contaminants such as Petroleum Hydrocarbons (C_{10}-C_{50}), PAH (Polycyclic Aromatic Hydrocarbons), MAH (Monocyclic Aromatic Hydrocarbons) and metals like mercury, silver, arsenic, cadmium, cobalt, chromium, copper, tin, manganese, molybdenum, nickel, lead and zinc.

5. EXCAVATION AND BACKFILL - PARKING AREAS, ACCESS ROADS, AND LANDSCAPED AREAS

5.1. The parking and access road subgrade preparation shall be completed as per Section "4.0 General Subgrade Preparation".

5.2. Beneath the proposed parking, access roads and landscaped areas, all surface vegetation, surface water, rootmat, organics, underlying topsoil, frozen soils, existing fill, debris, soft drainage ditch sediments, test pit backfill and other deleterious material must be removed. Organic soils below 1.8 m of finished grade and existing fill may remain beneath proposed pavement areas provided they are proven competent by proof rolling and approved by the Geotechnical Engineer.

5.3. Subgrade fill used for grading beneath asphalt or concrete pavement must consist of either acceptable fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill, approved by the Geotechnical Consultant prior to delivery to the site. Subgrade fill used below rigid surfaces, such as concrete sidewalks and concrete slabs, must not contain more than 25% silt.

5.4. Non-specified fills and on-site excavated soils may be used in landscaping areas and beneath parking areas where settlement of the ground surface is of minor concern. In landscaped areas the fill must be spread in thin lifts and compacted by the tracks of spreading equipment to minimize voids. When used to build up subgrade level in areas to be paved fill should be compacted in thin lifts to a minimum density of 95% SPMDD.

5.5. Existing engineered fill is also suitable for re-use as backfill material under pavement structures. Site excavated materials for re-use must be approved by the Geotechnical Consultant at the time of construction and stored on site in a way to avoid water infiltration and freezing.

5.6. The Contractor is responsible for constructing all temporary access roads, as required to complete the work. The Contractor must also maintain all temporary access roads in good and tidy condition at all times to the satisfaction of the Owner and/or Consultant.

All temporary access roads shall consist of approved Subgrade Material to allow heavy equipment traffic. If the building is constructed during the winter period, the Contractor is responsible for snow removal and spreading of abrasive throughout construction work by the building Contractor and his sub-contractors.

6. EXCAVATION AND BACKFILL - BUILDING FOOTPRINT

6.1. The building subgrade preparation shall be completed as per Section "4.0 General Subgrade Preparation"

6.2. Beneath the proposed footings of buildings, signs, light standards and their influence zones all surface vegetation, surface water, rootmat, organics, underlying topsoil, frozen soils, existing fill, debris, soft drainage ditch sediments, test pit backfill and other deleterious material must be removed. The influence zone is defined as a line drawn at 1 horizontal to 1 vertical outward and downward from the edge of footings, down to the competent native soil. All loose or disturbed materials must be removed and replaced with compacted structural fill.

6.3. Existing engineered fill is suitable for re-use as backfill material against foundation walls in combination with a perimeter drainage system (weeping tile).

6.4. Backfill against the exterior sides of the foundation walls must consist of free-draining non frost susceptible granular materials. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, must be used for this purpose. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls unless a composite drainage system, such as Miradrain G100N, is provided.

6.5. Structural fill used for grading beneath the footings of buildings, signs and light standards must consist of OPSS Granular 'A' or Granular "B" Type II Material and be approved by the Geotechnical Consultant prior to delivery to the site.

6.6. With the removal of all deleterious materials within the footprint of the proposed building, the native surface is considered an acceptable subgrade surface on which to commence backfilling the floor slab. The upper 150 mm of sub-slab fill must consist of OPSS Granular A material for slab on grade construction. All backfill within the footprint of the proposed building must be placed in maximum 300 mm thick loose lifts and compacted to a minimum density of 98% SPMDD.

7. PAVEMENT STRUCTURES, CONCRETE PADS, CURBS, AND SIDEWALKS

7.1. Construction of granular foundation must conform to OPSS 314.

7.2. Granular materials used on site must conform to the requirements of OPSS 1010.

7.3. Light duty and heavy duty asphalt pavements to be constructed as per Details #201, #202, and #205.

7.4. Road cut reinstatement as per City of Ottawa Detail R10. Reinstatement to match existing. Thickness and materials in accordance with detail #202 to be assumed.

7.5. Transition between existing and proposed pavement shall be constructed as per Detail #206.

7.6. Construction of asphalt must conform to OPSS 310.

7.7. Asphalt concrete material shall conform to OPSS 1151 for Superpave and Stone Mastic Asphalt Mixtures. Minimum Performance Graded (PG) 58-34 asphalt cement must be used for this project.

7.8. Asphalt mix design shall be reviewed and approved by the Geotechnical Consultant prior to start of paving.

7.9. Concrete curbs and gutter must conform to OPSS 353.

7.10. Concrete curbs to be constructed as per City of Ottawa Detail SC1.1.

7.11. Elevation at top of concrete curbs to be 150 mm above the asphalt, unless otherwise indicated on the drawings.

7.12. Concrete sidewalks must conform to OPSS 351.

7.13. Concrete sidewalks to be constructed as per Detail 106 and City of Ottawa Details SC2 and SC4, with joints in accordance with SC5.

7.14. Concrete slab for garbage enclosure as per Detail 115.

8. CONTRACT RESPONSIBILITIES AT THE PERIMETER OF BUILDING

8.1. Included in the site works contract:

- Cut or fill up to 300 mm below finished floor elevation for sidewalks and for all other concrete slabs around building.
- All landscaping around the building.

8.2. Included in the building contract:

- All necessary excavation to subgrade, granular materials, compaction and concrete work for sidewalks and all other concrete slabs around building area.

9. BUILDING PAD PREPARATION

9.1. In excavation areas, cut to 300 mm below finished floor elevation. In fill areas, structural fill to be placed to 300 mm below finished floor elevation.

Cominar

PROFESSIONAL ADVISORS

Architecture :

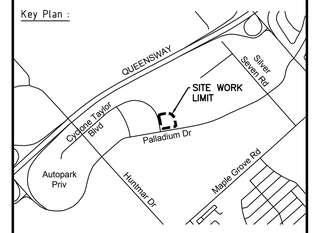
stgm architectes

Structure / Civil :

CIMA+

Mechanical / Electricity :

Key Plan :



REVISIONS

No	yy/mm/dd	Description	By
6	2019/06/12	SITE PLAN CONTROL 2nd ROUND - RESPONSES	B.T.
5	2019/05/28	FOR TENDER REVISION 1	B.T.
4	2019/05/28	SITE PLAN CONTROL 1st ROUND - RESPONSES	B.T.
3	2019/05/17	FOR TENDER	B.T.
2	2019/04/16	FOR PERMIT	B.T.
1	2019/03/08	FOR SITE PLAN APPROVAL	B.T.

Stamps :

Project :

OFFICE DEVELOPMENT
800 PALLADIUM DR.

Drawing :

NOTES PLAN

Designed By :	Drawn By :	
TIM KENNEDY	JONATHAN HAMEL	
Approved By :	File name .DWG	Scale :
C.L-L.	C005 - Notes Plan.DWG	NO SCALE
Date :	Project Number :	Sheet : / Number :
2019/03/08	A000919	C005

007-12-19-0045

PLAN No. 17904