ROBERT E. DALE
LIMITED
CONSULTING ENGINEERS

DESIGN IT RIGHT- REAP THE REWARDS

FUNCTIONAL SERVICING REPORT

3151 MONTROSE, NIAGARA FALLS, ONTARIO

JUNE 2, 2023

PREPARED FOR: PRIME CONSTRUCTION MANAGEMENT

Professional Engineers Ontario

429 Exmouth Street, Suite 208
Sarnia, ON N7T5P8
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1.0 INTRODUCTION

Robert E. Dale Limited, Consulting Engineers has been retained by Prime Construction Management to prepare a site specific Stormwater Management Report (SWM) and functional servicing report for the proposed development located at 3151 Montrose Road, Niagara Falls, Ontario (**Appendix "A"**), in accordance with the engineering standard drawings provided by the City of Niagara Falls, and MOE Stormwater Management Planning and Design Manual 2003 (SWMPD).

This report is prepared in support of a Site Plan Application (SPA) to be submitted by the client. The purpose of this report is to provide site-specific information for the Town's review with respect to the infrastructure required to support the proposed development regarding storm drainage.

An inventory of the existing infrastructure in the area of the proposed development was carried out. This report discusses the existing services together with the servicing requirements for the proposed development.

2.0 SITE DESCRIPTION

The site is surrounded by a mixture of commercial and residential properties.

The proposed site is approximately 5611 square metres in size. Currently the property is partially developed, with a single residential building onsite. A copy of the Predevelopment Site Plan is included in the appendix.

3.0 SITE PROPOSAL

The Site Plan Application proposes multiple residential townhome style row housing buildings, with an associated roadway. The remainder of the site would be landscaped space. A reduced version of the site survey drawing and site plan is included in **Appendix "A"**. Please refer to the building and site statistics provided by the architects site plan. In the post-development condition, this application proposes new storm services and SWMM services as per the City of Niagara Falls Engineering Standards.

4.0 STORMWATER MANAGEMENT AND DRAINAGE

4.1 Design Criteria

The proposed development will meet the Province of Ontario standards as set out in the MOE Stormwater Management Planning and Design Manual 2003 (SWMPD), the City of Niagara Falls Design Criteria and local engineering standards. A brief summary of design criteria are as follows;

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- For this development, return frequency values for design shall be 5-year for the Minor System and 100--year for the Major System.
- City of Niagara Falls Erie IDF Curves are to be used for analysis **(Appendix "B")**.
- The post-development peak flows for all events from the site should be controlled to the peak flow of 29 litres per second as provided by the City of Niagara Falls Engineering Department.

4.2 Existing Conditions

Calculations completed by this Office have analyzed the predevelopment as a fully developed residential site, using a weighted runoff co-efficient of 0.40 (from the engineering standards for single family dwellings) for the initial pre-development condition.

The overall predevelopment area for the site of 5611 m2 has been utilized.

For calculating the pre-development discharge rates and runoff for 2-Year, 5- Year and 100-Year storm events, Inlet time of Concentration (Tc) is based on the minimum TC recommended for small sites (10 minutes). The value for the weighted runoff coefficient (C) is calculated based on actual surface conditions per the Engineering Standards. Input parameters used to model the target pre-development condition are provided in **Table-1** below and detailed calculations have been illustrated in **Appendix "B"**.

Table-1 Pre-development Input Parameters

Catchment Mark	Drainage Area (m2)	2 Year Runoff Co-efficient	100 Year Runoff Co-efficient	Time of Concentration
Pre Development	5611	0.40	0.40	10

The pre-development peak flow was calculated using City of Niagara Falls Rainfall Intensity Curves using the Rational Method. Results of the pre-development peak flow calculations are provided in **Table-2** below, and detailed pre-development flow calculations have been illustrated in **Appendix "B".**

Catchment #	**Peak Flow** (m^3/s)		
	2-year	**5-year**	**100 Year**
Pre-Development	0.0723	0.0958	0.1591

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4.3 Stormwater Management

In the post-development condition, direction has been provided the entirety of the site shall be controlled to the allowed 29 lps flows. This will be achieved through orifice restrictors placed at the outlet pipe, located in the outlet structure.

4.3.1. Quantity Control

Stormwater quantity control is typically implemented to minimize the potential for downstream flooding, stream bank erosion and overflow infrastructure. As per minimum standards provided, the post-development peak flows for all events from the site area should be controlled in line with the respective peak flow resulting from the target pre-development condition (29 lps) to 100-year post development storm events.

Modified Rational Method calculations were undertaken to determine the peak flows and required storage volume from the proposed site during 2-Year through 100-Year storm events. This method calculates the storage volume using the composite runoff coefficient and the allowable release rate based on rainfall intensities over a three-hour storm event.

For calculating the post-development discharge rates and runoff for 2-Year, through 100-Year storm events, Inlet time of Concentration (Tc) and weighted runoff coefficient (C) is calculated similar to the pre-development calculations. Input parameters used to model the target pre-development condition are provided in **Table-3** below and detailed calculations have been illustrated in **Appendix "B"**.

Table 3- Post Development Input Parameters:

Catchment Mark	Drainage Area (m2)	2 Year Runoff Co-efficient	100 Year Runoff Co-efficient	Time of Concentration
Post Development	5611	0.75	0.75	10

Results of the post-development peak flow calculations by considering minimum Tc and IDF data same as pre-development flow calculations are provided in **Table-4** below, and detailed post-development flow calculations have been illustrated in **Appendix "B".**

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Table-4 Post Development Peak Flows

Catchment #	Peak Flow (m^3/s)		
	2-year	5-year	100 Year
Post Development	0.0904	0.1198	0.1989

The post-development peak flow targets will be achieved for the development using parking lot storage, with additional available in the underground pipe. When the flow is greater than the allowable peak discharge rate through the outlet orifice, the system will surcharge and the excess runoff volume will be stored on the parking area. Storage is available onsite for up to, and including the 100 year storm.

The outlet pipe will all be sized with a restrictor plate in it, designed to suit the 29 lps.

RESTRICTED FLOW (cu.m./sec):	0.02900
GRAVITY HEAD (metres):	1.93
2 * (Q / 0.6 * 3.1428)E.5	0.24802
2 * (9.8 * H)E.25	2.48001
ORIFICE DIAMETER (millimeters):	100.00868

Table 5a- Ponding Requirements-

Storm Event	Storage Required/Provided	Ponding Elevation
2 Year	39.7m3/118.4m3	193.504m
5 Year	53.4m3/118.4m3	194.415m
100 Year	97.4m3/118.4m3	194.569m

The minor system has been designed using the 5 year return, with an initial time of concentration of 10 minutes. Detailed calculations are included in the appendix.

4.3.2. Quality Control

Quality control is being provided to the site by way of an oil grit separator, sized to suit a minimum 80% TSS removals rate. The unit selected is a HydroGuard HG-4, with a design TSS removals rate of 85%. Detailed calculations are in the appendix.

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Maintenance of System:

Purpose:
To provide a set of best practice site management procedures to control the severity and extent of soil erosion on this site.

Responsibility:
The owner of the property will be responsible for the implementation and maintenance of the Storm Water Management criteria and system throughout its lifetime. The construction contractor will be responsible for the implementation of the Stormwater Management Plan (SWMP) during the course of all construction activities.
Implementation Strategy:
Permanent and long term swales and ditches to be top soiled and vegetated with suitable vegetation as soon as possible.
Clean up of general site litter on a weekly basis, prior to anticipated heavy rainfall and after significant rainfall events (>25mm/24 hours).

Landscaping activities and revegetation to occur as soon as practical after completion of earthworks and construction activities within the design rea.
Only appropriate herbicides and fertilizers to be used.

Monitoring:
Erosion and sediment control (ESC) measures to be inspected on an ongoing basis by the site manager, or nominated representative, during periods of run off producing rainfall, and de-silted, repaired and amended as appropriate to maintain the quality standards.

Site inspections, during periods of runoff producing rainfall must include:
- All drainage, erosion and sediment control procedures and measures;
- Occurrences of excessive sediment deposition (whether on site or off site)
- All site discharge points

Ongoing site inspections must include:
- All drainage, erosion and sediment control measures;
- Occurrences of excessive sediment deposition (whether on site or off site)
- All site discharge points
- Occurrences of construction materials, litter or sediment placed, deposited, washed or blown from the site, including deposition by vehicular movements.
- Litter and waste receptors
- Oil, fuel and chemical storage facilities.

Site inspections immediately prior to anticipated runoff producing rainfall shall include:
- All drainage, erosion, and sediment control measures;

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- All temporary (ie overnight) flow diversion and drainage works (if approved by engineering staff)

Identifications of an Incident or Failure shall include:
Non compliance with agreed performance criteria will be identified by :

- Visual inspections identifying:
  - buildup of sediment off the site;
  - excessive sediment buildup on the site;
  - excessive erosion on the site;
  - release of construction material from the site;
  - poor vegetation establishment;
  - poorly maintained, damaged or failed ESC devices;
  - deteriorated water quality identified by the consultant as being attributable to the construction activities.

Reporting Requirements:

Reports will be submitted as requested during the construction at each stage: This reporting shall include:
Construction Contractor site manager's report;
Water Quality monitoring report.

Reporting will follow the same criteria during the ongoing maintenance periods.

4.4 Down Stream Capacity

In the pre-development condition, this site contributes to the existing storm sewer infrastructure. Since the 100 year post-development peak flows for all events from the site are controlled in line with the respective 2 year peak flow resulting from the target pre-development condition during all storm events, the total release from the site will be equal to the existing pre-development condition. Hence, there will be no need to map downstream capacity of existing storm sewers.

5.0 Erosion and Sediment Control During Construction

Construction activity, especially operations involving the handling of earthen material, dramatically increases the availability of particulate matter for erosion and transport by surface drainage. In order to mitigate the adverse environmental impacts caused by the release of silt-- laden stormwater runoff into receiving watercourses, measures for erosion and sediment control are required for construction sites.

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The impact of construction on the environment is recognized by the Greater Golden Horseshoe Area Conservation Authorities. "Erosion & Sediment Control Guidelines for Urban Construction" released by the Authority in December 2006, provides guidance for the preparation of effective erosion and sediment control plans.

Control measures must be selected in light of the erosion potential of the site. It is important to have site modifications and implementations on a staged basis to reflect the site's activities. Furthermore, the effectiveness of control measures decreases with sediment loading as a result inspection and maintenance is recommended. The selection, implementation, inspection, and maintenance of the control features are summarized as follows:

5.1 Control Measures

On relatively small sites, measures for erosion and sediment control typically include the use of silt fencing, mud mats and sediment traps. The description of the sediment controls to be implemented on the subject site is as follows.

Installation of ***Silt Fences*** adjacent to all property limits subject to drainage from the development area prior to topsoil stripping and in other locations, such as at the bases of topsoil stockpiles.

Installation of ***Mud Mats*** at all construction entrances prior to commencing earthworks to minimize the tracking of mud onto municipal roads.

Installation of ***Sediment Traps*** at all catch basins and area drain locations once the storm sewer system has been constructed to prevent silt-laden runoff from entering the municipal storm sewer system.

5.2 Construction Sequencing

The schedule of construction activities with respect to sediment controls are as follows:

Installation of the silt fences prior to any other activities on the site
Construction of temporary mud mats at all construction access.
Installation of site servicing and underground utilities.
Construction of building foundations and disposal of all the surplus excavated materials off site.
Construction of building, parking lot and driveways.
Restoration / re-vegetation of disturbed areas either with temporary measures such as mulch or seeding or with final landscape and paving materials.
Removal of the sediment controls following stabilization of disturbed areas.

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5.3 Inspection and Maintenance

In order to ensure that the erosion and sediment control measures operate effectively, regular monitoring together with periodic cleaning (e.g. removal of accumulated silt), maintenance and/or re-construction is strongly recommended. Inspections of all the erosion and sediment controls on the construction site should be undertaken with the following frequency:

- On a weekly basis
- After every rainfall event
- After significant snow melt events
- Prior to forecasted rainfall events

If damaged control measures are found, they should be repaired and/or replaced within 48 hours.

6.0 Sanitary Service

6.1 Existing Sanitary Service

There is an existing 200 mm sanitary service located within Montrose Road that we are proposing connecting into.

6.2 Sanitary Design Flow

The sanitary service design flow is as calculated below:

Sanitary sewage flows shall be estimated using the following formula:

$$Q = \frac{PqM}{86.4} + IA$$

Where: Q = Peak sewage flow including infiltration, liters/sec (l/s)
P = Population density, in thousands
q = Average daily domestic flow at 320 liters/capita/day (lpcd)
M = Peaking factor, $M = \frac{5}{P^{0.2}}$ minimum = 2.0, maximum = 4.5
I = Infiltration allowance, 0.15 l/sec/ha - for new subdivisions

0.28 l/sec/ha - for older tributary areas or as determined by field monitoring

A = Tributary area, hectares (ha)

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The number of people has been calculated using the capacity of 4 persons per residential suite, which gives a design flow of 0.62 lps. Full design calculations are included in the appendix.

The proposed sanitary service is 200mm diamter pvc dr35 sanitary sloped at 0.4%, which has an allowable flow of 21.64 lps,far greater than the design flows of 0.62 lps.

7.0 Water Service

7.1 Existing Water Service

There is an existing 300mm diameter water main provided within Montrose Road

7.2 Water Design Flow

The water service flow has been calculated in conformance with the requirements of the Ontario Building Code, and is indicated below:

Domestic Flow

Specified Data		
l = length of pipe (m)	117	
c = Hazen-Williams roughness constant	140	
q = volume flow (liter/sec)	0.3148	
dh = inside or hydraulic diameter (mm)	200	
Calculated Pressure Loss		
f = friction head loss in mm of water per 100 m of pipe (mm H20 per 100 m pipe)	0.10	
f = friction head loss in kPa per 100 m of pipe (kPa per 100 m pipe)	0.00	
Head loss (mm H20)	0.11	
Head loss (kPa)	0.00	
Calculated Flow Velocity		
v = flow velocity (m/s)	0.01	
Number of Residences	17	
Residence Flow per Day	1600	litres
Total Flow per Day	27200	litres
Design Flow	0.3148	lps

Fire Flow has also been calculated, at a rate of 11,143 l/min.

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8.0 Conclusions:

This report is to be read in conjunction with the submission materials for the project proposal. Based on our investigation, we conclude and recommend the following:

The post-development peak flow targets will be achieved by controlling discharge from the site using the above noted storm water criteria. The site will be restricted to the allowable runoff of 29 lps. Storage on site is available for up to, and including, the 100 year storm.

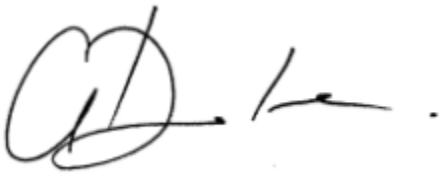
Erosion and Sediment controls are to be implemented during construction to prevent silt-laden runoff from leaving the site in accordance with the "Erosion & Sediment Control Guidelines for Urban Construction".

Maintenance of the SWM items is the sole responsibility of the owner of the site. The maintenance shall be completed in accordance with the requirements as set out in this report.

Sanitary design flows have been calculated as 0.62 lps. The proposed design sanitary sewer has an allowable flow well above that.
As calculated in section 7.0, the water design flow has an approximate design requirement of 27,200 litres/day.

In summary, all elements of the design requirements as set out by the design Standards have been met or exceeded by the proposed design.
We trust that this report satisfies the requirements of the Town with respect to the subject development. Should you have any questions, please feel free to contact the undersigned.

Yours truly,



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Appendix "A" Plans

- Location Map
- IDF Curves
- Pre-Development Drawings
- Post Development Drawings
- Sanitary Servicing Calculations
- Storm Servicing Calculations
- SWMM Modelling Data and Results

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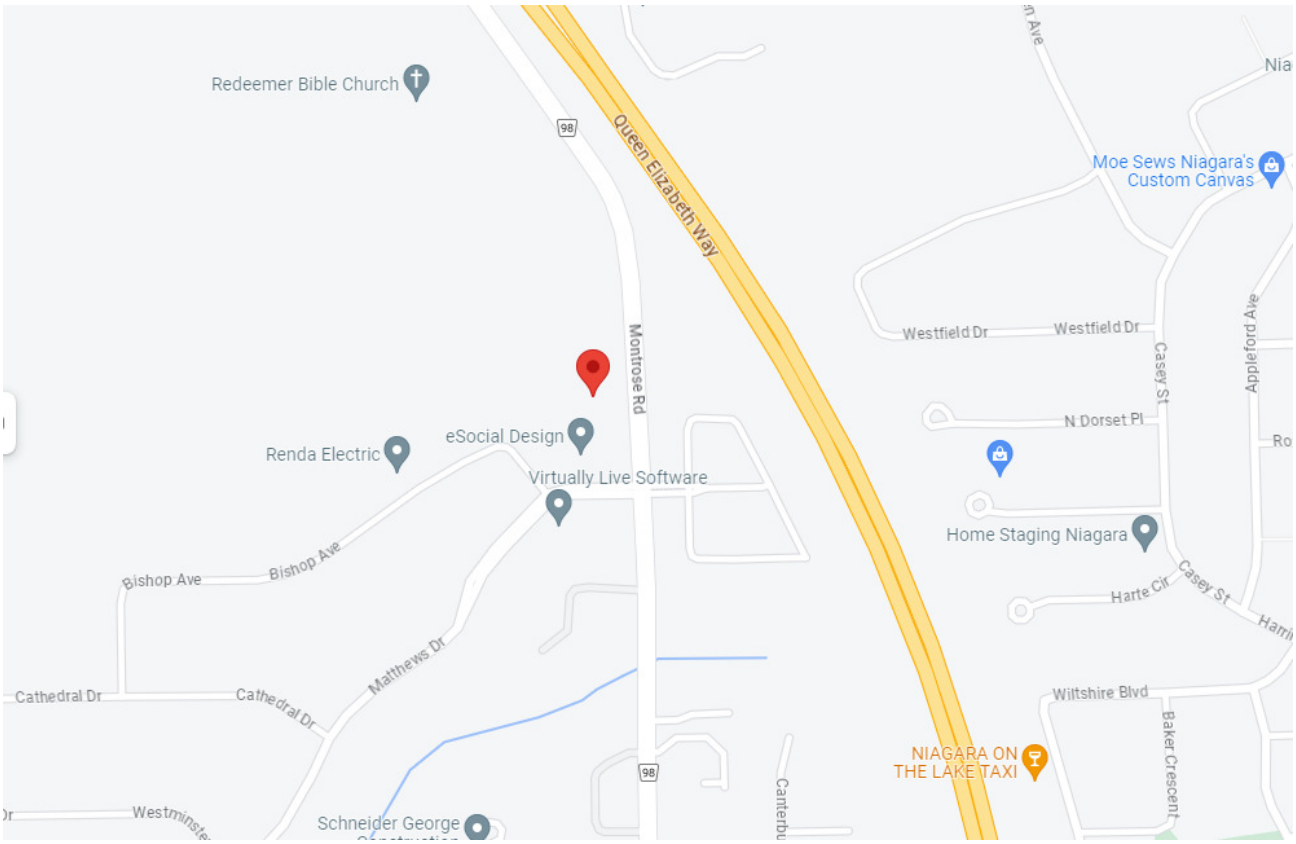

Site Location Map

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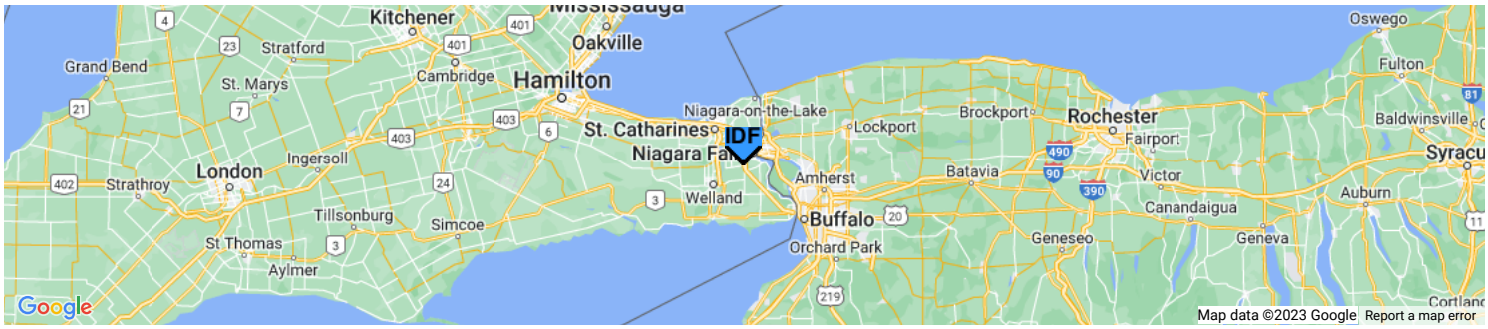
Active coordinate

43° 3' 15" N, 79° 7' 14" W (43.054167,-79.120833)

Retrieved: Sat, 27 May 2023 19:20:52 GMT



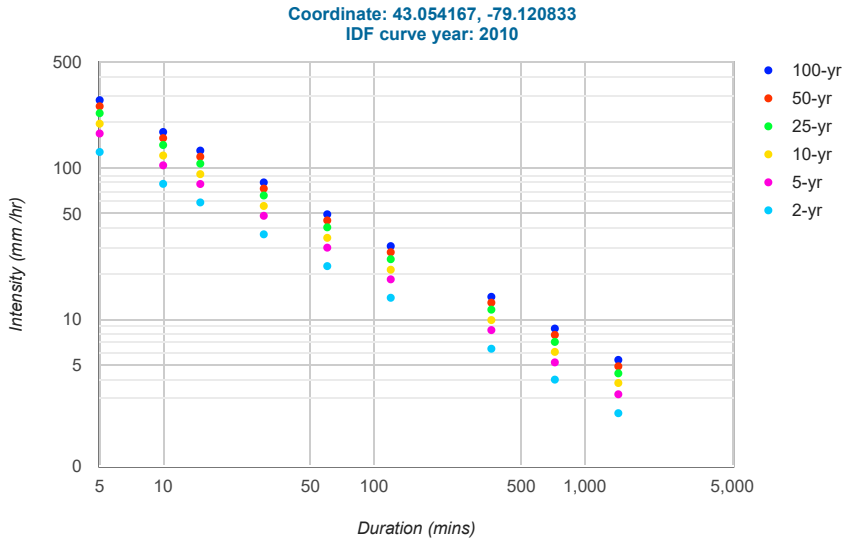
Location summary

These are the locations in the selection.

IDF Curve: 43° 3' 15" N, 79° 7' 14" W (43.054167,-79.120833)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 43° 3' 15" N, 79° 7' 14" W (43.054167,-79.120833)

Retrieved: Sat, 27 May 2023 19:20:52 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	22.5	29.8	34.6	40.6	45.1	49.5
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	127.8	78.7	59.3	36.5	22.5	13.9	6.4	4.0	2.4
5-yr	169.3	104.3	78.5	48.4	29.8	18.4	8.5	5.2	3.2
10-yr	196.5	121.1	91.2	56.2	34.6	21.3	9.9	6.1	3.8
25-yr	230.6	142.1	107.0	65.9	40.6	25.0	11.6	7.1	4.4
50-yr	256.2	157.8	118.9	73.2	45.1	27.8	12.9	7.9	4.9
100-yr	281.2	173.2	130.5	80.4	49.5	30.5	14.1	8.7	5.4

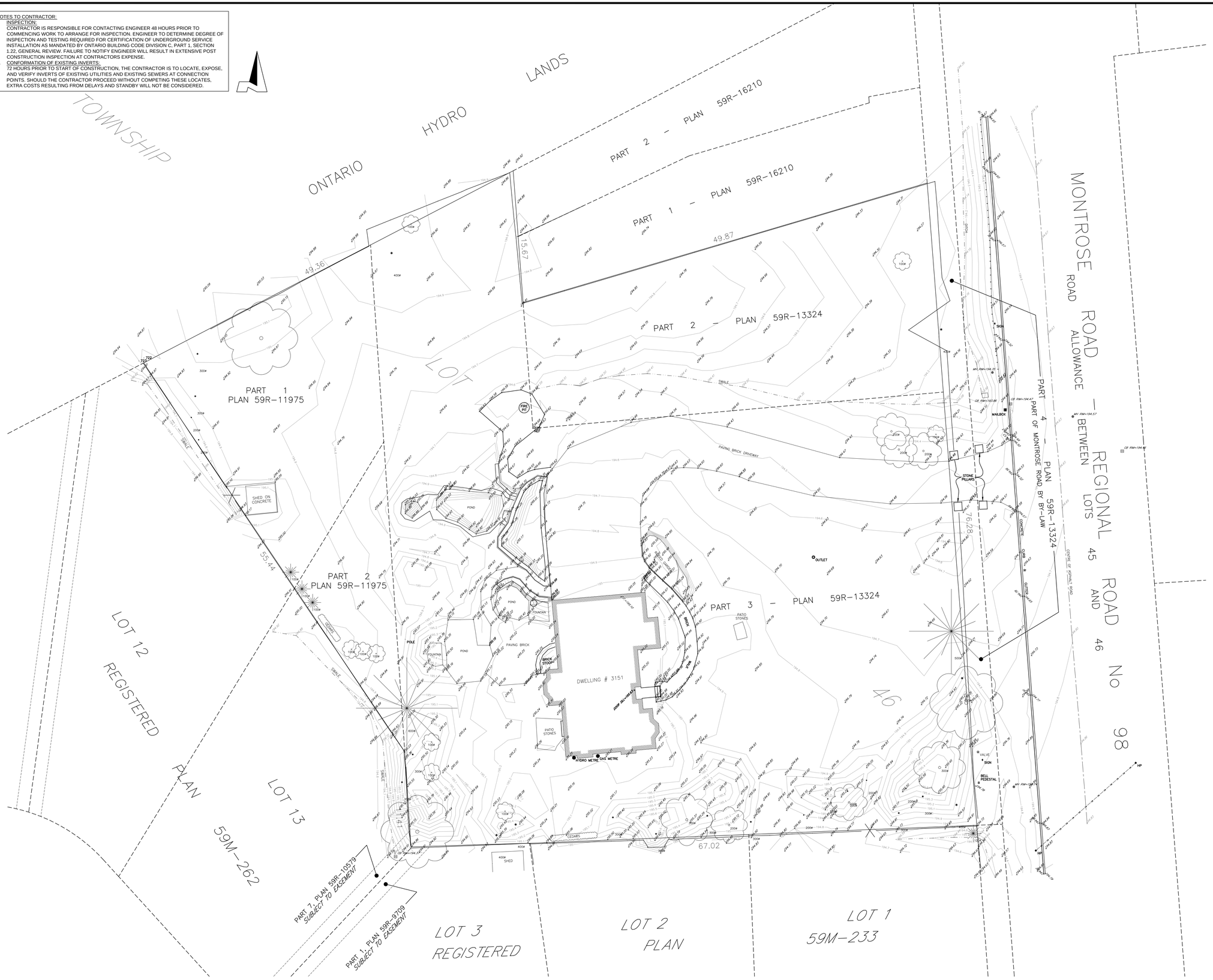
Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.6	13.1	14.8	18.3	22.5	27.7	38.6	47.5	58.6
5-yr	14.1	17.4	19.6	24.2	29.8	36.7	51.1	63.0	77.6
10-yr	16.4	20.2	22.8	28.1	34.6	42.6	59.3	73.1	90.1
25-yr	19.2	23.7	26.7	33.0	40.6	50.0	69.6	85.8	105.7
50-yr	21.3	26.3	29.7	36.6	45.1	55.6	77.3	95.3	117.4
100-yr	23.4	28.9	32.6	40.2	49.5	61.0	84.9	104.6	128.8

Terms of Use

NOTES TO CONTRACTOR:

1. INSPECTION:
   CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HOURS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.22, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.
2. CONFORMATION OF EXISTING INVERTS:
   72 HOURS PRIOR TO START OF CONSTRUCTION, THE CONTRACTOR IS TO LOCATE, EXPOSE, AND VERIFY INVERTS OF EXISTING UTILITIES AND EXISTING SEWERS AT CONNECTION POINTS. SHOULD THE CONTRACTOR PROCEED WITHOUT COMPETING THESE LOCATES, EXTRA COSTS RESULTING FROM DELAYS AND STANDBY WILL NOT BE CONSIDERED.



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NO.	REVISION	DATE
A	PRELIMINARY–ISSUED WITH CIVIL BRIEF	06/02/2023

STAGE OF DESIGN AND DRAFTING:

■	Issued for Site Plan Approvals	
	Preliminary Design	
	Issued for Comments and Coordination	
	Issued for Building Permit	
	Issued for Tender	
	Issued for Construction	
	As Built Record Set	

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not valid unless signed

PROJECT
SITE PLAN/CIVIL DESIGN FOR 3151 MONTROSE ROAD NIAGARA FALLS, ONTARIO

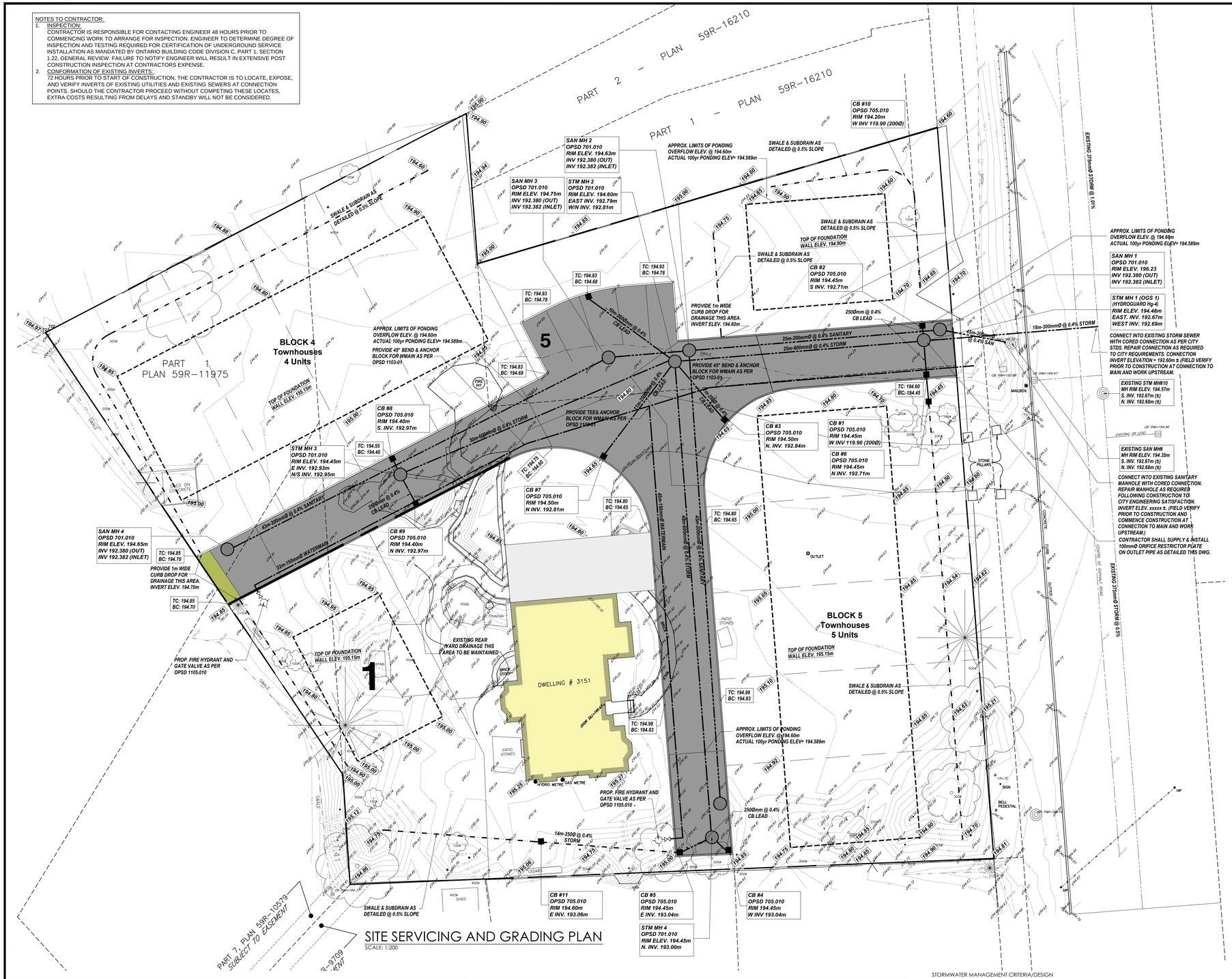
ARCHITECT:

DWG. TITLE
PRE DEVELOPMENT PLAN

DATE	MAY 25 2023	SCALE	1:200 METRIC
DESIGNED BY	G.DALE	DRAWING No.:	CVL-1
DRAWN BY	W.J.REED		
PROJ. No.	230384		

NOTES TO CONTRACTOR:

1. INSPECTION:
   CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HOURS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.22. GENERAL REVIEW BY OR FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.
2. CONFORMATION OF EXISTING INVERTS:
   72 HOURS PRIOR TO START OF CONSTRUCTION, THE CONTRACTOR IS TO LOCATE, EXPOSE, AND VERIFY INVERTS OF EXISTING UTILITIES AND EXISTING SEWERS AT CONNECTION POINTS. SHOULD THE CONTRACTOR PROCEED WITHOUT COMPETING THESE LOCATES, EXTRA COSTS RESULTING FROM DELAYS AND STANDBY WILL NOT BE CONSIDERED.

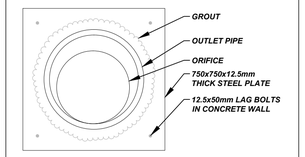


SITE SERVICING AND GRADING PLAN

SCALE: 1:200

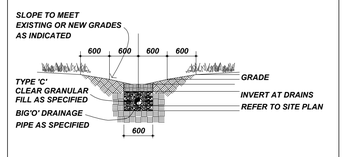
LEGEND

- EXISTING WATERMAIN (400 WM)
- EXISTING SANITARY SEWER (300 SAN)
- EXISTING STORM SEWER (1500 ST)
- EXISTING GASMAIN
- EXISTING BELL PEDISTAL (B.BOX)
- EXISTING SANITARY/STORM MAINTENANCE HOLE (SA21 ST11)
- EXISTING CATCHBASIN (CB)
- EXISTING DOUBLE CATCHBASIN (DCB)
- EXISTING WATER VALVE (WV)
- EXISTING FIRE HYDRANT (FH)
- EXISTING HYDRO POLE (HP)
- EXISTING FENCE
- PROPOSED WATERMAIN (200 WM)
- PROPOSED WATER VALVE AND BOX (VB)
- PROPOSED CAP
- PROPOSED SANITARY SEWER (200 SAN)
- PROPOSED SANITARY MAINTENANCE HOLE (SA21)
- PROPOSED SANITARY CLEANOUT (CO)
- PROPOSED STORM SEWER (250 ST)
- PROPOSED CATCHBASIN (CB)
- PROPOSED STORM MANHOLE (ST21)
- PROPOSED FINAL GRADE (100.00)
- ENTRANCE SYMBOL



ORIFICE PLATE DETAIL

SCALE: NTS



SWALE DETAIL

SCALE: NTS

STORMWATER MANAGEMENT CRITERIA/DESIGN

Pre Development Flows

Catchment #	Peak Flow (m³/s) 2-year	5-year	100 Year
Pre-Development	0.0723	0.0958	0.1591

Post Development Flows

Table 3- Post Development Input Parameters:

Catchment Mark	Drainage Area (m2)	2 Year Runoff Co-efficient	100 Year Runoff Co-efficient	Time of Concentration
Post Development	5611	0.75	0.75	10

Catchment #	Peak Flow (m³/s) 2-year	5-year	100 Year
Post Development	0.0904	0.1198	0.1989

Table 5a- Ponding Requirements-

Storm Event	Storage Required/Provided	Ponding Elevation
2 Year	39.7m3/118.4m3	193.504m
5 Year	53.4m3/118.4m3	194.415m
100 Year	97.4m3/118.4m3	194.569m

WATERMAINS:

1. PVC WATERMAINS SHALL BE A MINIMUM DR 18 CLASS 235 (AWWA) C900-07.
2. EMBEDMENT MATERIAL FOR FLEXIBLE PIPE SHALL BE ACCORDING TO OPSD 802.010 AND USING GRANULAR A ACCORDING TO TS 1010 AND COMPACTED TO MINIMUM 98% F MAXIMUM DRY DENSITY.
3. MINIMUM COVER ON WATERMAINS SHALL BE 1.8m.
4. ALL HYDRANTS SHALL BE CONSTRUCTED ACCORDING TO T-1105.01.
5. HYDRANT LEADS SHALL BE MINIMUM DR 18 CLASS 235 (AWWA) C900-07.
6. ALL SERVICE CONNECTIONS SHALL REQUIRE A SERVICE CONNECTION PERMIT FROM THE INFASTRUCTURE SERVICES DEPARTMENT. THE FINAL DETAILS OF THE CONNECTION WILL BE DETERMINED THROUGH THE SERVICE CONNECTION PERMIT PROCESS.
7. SINGER WATER SERVICE CONNECTIONS SHALL BE MINIMUM OF 19mm DIA. TYPE "K" SOFT COPPER ACCORDING TO CITY STANDARDS. WHEN SERVICE LENGTH EXCEEDS 30m, THE DIAMETER SHALL BE 25mm DIA.
8. ALL CURB AND VALVE BOXES SHALL BE LOCATED AT STREET LINE.
9. MECHANICAL THRUST RESTRAINTS SHALL BE INSTALLED AT ALL FITTINGS, BENDS. TEES. CROSSES. REDUCERS AND VALVES FOR ALL WATERMAIN SIZES. MECHANICAL RESTRAINTS AT JOINTS SHALL BE INSTALLED AT EVEY PIPE JOINT 6.1mOF EITHER SIDE OF THE VALVE FOR WATERMAIN 100mm DIAMETER OR LARGER.
10. ALL TEES, PLUGS, HORIZONTAL, VERTICAL BENDS, REDUCERS AND HYDRANTS TO HAVE CONCRETE THRUST BLOCKS ACCORDING TO T-11103.01 AND T-1003.020.
11. WATERMAINS MUST FOLLOW THE ONTARIO MINISTRY OF ENVIRONMENT PROCEDURE F-6-1 THAT GOVERN THE SEPARATION OF SEWERS AND WATERMAINS. A MINIMUM VERTICAL CLEARANCE OF 0.30m WHEN CROSSING OVER AND 0.5m WHEN CROSSING UNDER SEWERS AND ALL OTHER UTILITIES IS REQUIRED. MUST ALSO MAINTAIN 2.5m HORIZONTAL SEPARATION WITH SEWERS.
12. ALL VALVES LESS THAN 400mm WILL BE IN A VALVE AND BOX ACCORDING TO T-1101.02-2. ALL VALVES 400mm AND LARGER SHALL BE IN A CHAMBER.
13. SACRIFICIAL ANODES SHALL BE INSTALLED ON ALL METALLIC PIPES AND APPURTENANCES, WATER SERVICES AND FITTINGS ACCORDING TO T-1106.04, T-106.05, T01106.06, AND TS 7.22.
14. TRACER WIRE INSTALLATION SHALL BE BE ACCORDING TO TS 7.40.
15. HYDROSTATIC PRESSURE TEST AND LEAKAGE TESTING OG THE WATERMAIN SHALL BE ACCORDING TO CITY REQUIREMENTS.
16. THE NEW WATERMAIN SHALL BE ISOLATED ACCORDING TO CITY REQUIREMENTS UNTIL BACTERIOLOGICAL TESTS ARE SATISFACTORILY COMPLETED.
17. PROVISIONS FOR FLUSHING THE WATERMAIN PRIOR TO TESTING AND SO FORTH MUST BE PROVIDED WITH AT LEAST A 50mmm OUTLET ON 100mm AND LARGER LINES ACCORDING TO CITY REQUIREMENTS. COPPER WATER SERVICES SHALL BE HAVE FLUSHING POINTS AT THE END, THE SAME AS THE LINE. ON FIRE LINES, FLUSHING OUTLET TO BE 50mm DIAMETER MINIMUM OR A HYDRANT.

ROAD RECONSTRUCTION:

1. CONSTRUCTION AND RECONSTRUCTION OF ALL ACCESS DRIVEWAYS SHALL BE ACCORDING TO CITY STANDARDS AT NO COST TO THE MUNICIPALITY.
2. LIMITS OF THE SIDEWALK/CURB RECONSTRUCTION ARE APPROXIMATE. ACTUAL LIMITS ARE TO BE CONFIRMED IN THE FIELD BY THE CONTRACT ADMINISTRATOR.
3. ADJUST ALL STRUCTURES (MAINTENANCE HOLES, CATCH BASINS, ETC) TO SUIT THE NEW DESIGN ELEVATIONS INCLUDING BREAKING DOWN AND REMOVAL OF PORTIONS OF THE TOP OF STRUCTURES TO ALLOW DOE MINIMUM 150mm ADJUSTMENTS.
4. ALL CURB SHALL BE CONSTRUCTED WITH A LEDGE AT THE BACK OF THE CURB TO FACILITATE FUTURE SIDEWALK CONSTRUCTION.
5. FULL DEPTH SAW-CUTS ARE REQUIRED AT CONSTRUCTION LIMITS OF EXISTING CURB,SIDEWALK AND PAVEMENT UNLESS OTHERWISE SHOWN.
6. SAW CUT EXISTING PAVEMENT, SIDEWALK, CURB, GUTTER, DRIVEWAYS, WALKWAYS ETC. AT CONSTRUCTION LIMITS TO PROVIDE A CLEAN JOINT FOR THE PROPOSED WORK.
7. CONSTRUCT PEDESTRIAN SIDEWALK RAMPS WITH TACTILE WALKING SURFACE INDICATORS ACCORDING TO CITY STANDARDS.
8. EXISTING ENTRANCE RAMPS TO BE RE-INSTALLED. VEHICULAR SIDEWALK RAMP SHALL BE ACCORDING TO CITY STANDARDS.
9. ADJUSTMENT OR APPROACHES, WALKWAYS, AND STEPS MAY BE REQUIRED. LIMITS ARE TO BE DETERMINES IN THE FIELD BY THE CONTRACT ADMINISTRATOR.
10. EXISTING ASPHALT THICKNESS MAY VARY, TAPER TO MATCH EXITING AT CONSTRUCTION LIMITS (MINIMUM 2.0).

GRADING NOTES:

1. ALONG ADJOINING PROPERTIES GRADE TO MEET EXISTING OR PROPOSED ELEVATIONS WITH SODDED SLOPES,(MIN. 3H TO 1V) AND/OR RETAINING WALLS AS SPECIFIED.
2. ALL RETAINING WALLS, WALKWAYS, CURBS, ETC SHALL BE PLACED A MIN. OF 0.45m OFF THE PROPERTY LINE. ALL WALLS 1.0m OR HIGHER SHALL BE DESIGNED BY A P.ENG.
3. SHOULD A RETAINING WALL BE REQUIRED, THE TOP OF WALL ELEVATION SHALL BE SET 150mm ABOVE THE PROPOSED SIDE YARD SWALES.
4. RETAINING WALLS 0.6m IN HEIGHT OR GREATER REQUIRE CONSTRUCTION OF A FENCE OR GUARD FAIL AT THE TOP OF THE REAR OF THE WALL. GUARDS FOR RETAINING WALLS SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF EXTERIOR GUARDS AS CONTAINED IN THE ONTARIO BUILDING CODE.
5. TOP OF FOUNDATION WALLS FOR BUILDINGS SHALL BE 150mm (MIN) ABOVE FINISHED GRADE.
6. DRIVEWAY SLOPES SHALL NOT BE LESS THAN 2% AND NOT MORE THAN 8.0%. REVERSED SLOPED DRIVEWAYS IN NEW DEVELOPMENTS ARE NOT PERMITTED.
7. IF GRADING IS REQUIRED ON LANDS ADJACENT TO THE DEVELOPMENT WHICH ARE NOT OWNED BY THE DEVELOPER, THEN THE DEVELOPER MST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNER TO ALLOW THE DEVELOPER TO GRADE ON THE ADJACENT LANDS, OTHERWISE RETAINING WALLS MUST BE USED.
8. THE WRITTEN PERMISSION REQUIRED FROM THE ADJACENT LANDOWNER SHALL BE OBTAINED PRIOR TO ENTERING THE LANDS. SHOULD PERMISSION NOT BE OBTAINED OR IS WITHDRAWN PRIOR TO THE COMMENCING OF WORK, THEN THE DEVELOPER SHALL LIMIT HIS ACTIVITIES TO THE LIMITS OF THE DEVELOPMENT SITE.
9. DRIVEWAY AND DRIVEWAY APPROACHES SHALL BE LOCATED SUCH THAT HYDRO VAULTS AND OTHER STREET FURNITURE ARE A MIN OF 1.2m FROM THE PROJECTION OF THE OUTSIDE GARAGE WALLS.
10. ANY CHANCES IN GRADES AND CATCH BASINS REQUIRE THE APPROVAL OF THE CITYS MANAGER OF DEVELOPMENT ENGINEERING.
11. ALL DRIVEWAYS FROM PROPERTY LINES FOR THE FIRST 7.5m SHALL BE WITHIN 5% MAXIMUM GRADE. THEREAFTER, ALL DRIVEWAYS SHALL BE WITHIN 10% MAXIMUM GRADES.

LEGISLATION, REGULATION AND CODES:

1. ALL WORK WITHIN THE CITY RIGHT-OF-WAY SHALL BE CONSTRUCTED ACCORDING TO THE LATEST CITY OF NIAGARA FALLS STANDARD DRAWINGS AND SPECIFICATIONS. ONTARIO PROVINCIAL STANDARD DRAWINGS AND SPECIFICATION MAY, SUBJECT TO THE APPROVAL OF THE CITY OF NIAGARA FALLS, BE USED WHERE NO CITY STANDARD OR SPECIFICATION IS AVAILABLE.
2. AL WORK SHALL BE COMPLETED ACCORDING TO THE CURRENT OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS THE GENERAL CONTRACTOR SHALL BE DEEMED THE CONSTRUCTOR AS DEFINED IN THE ACT.
3. ALL TEMPORARY TRAFFIC CONTROL AND SIGNAGE DURING CONSTRUCTION SHALL BE ACCORDING TO THE CURRENT ONTARIO TRAFFIC MANUAL BOOK 7: CONDITIONS FIELD EDITION.

CONSTRUCTION NOTES:

1. ALL MATERIAL FOR SEWER FORCEMAIN, WATERMAIN, HYDRANTS, AND APPURTENANCES SHALL BE ACCORDING TO CITY SPECIFICATIONS AS REQUIRED.
2. UTILITY SEPARATION SHALL BE ACCORDING CITY DESIGN CRITERIA FOR SEWERS AND WATERMAINS MANUAL.
3. SERVICE CONNECTIONS AND UTILITY CUTS MADE IN ROAD PAVEMENTS SHALL BE BACKFILLED WITH UNSHRINKABLE FILL ACCORDING TO CITY STANDARDS.
4. ALL AREAS DISTURBED DURING CONSTRUCTION WITHIN THE CITY'S RIGHT-OF-WAY SHALL BE RESTORED TO ORIGINAL OR BETTER CONDITIONED TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR. GRASS AREAS SHALL BE TREATED WITH 100mm OF TOPSOIL AND SHALL BE SODDED ACCORDING TO CITY STANDARDS.
5. ALL EXISTING UTILITIES SHOWN ON DRAWINGS (PLAN AND PROFILE) ARE FOR REFERENCE PURPOSES ONLY. THE CONTRACTOR SHALL SATISFY THEMSELVES AS TO THE ACTUAL LOCATION AND DEPTH OF ANY UTILITY AND SHALL BE LIABLE FOR ALL OR ANY DAMAGE.
6. ANY DISCREPANCIES BETWEEN SITE CONDITIONS AND CONSTRUCTION DRAWINGS MUST BE REPORTED TO THE CITY PRIOR TO COMMENCEMENT OF CONSTRUCTION AND APPROPRIATE ACTION TAKEN TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR.
7. ALL SURVEY STAKE LAYOUT POINTS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION. ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE LAYOUT SHALL BE REPORTED IMMEDIATELY TO THE CITY.
8. ATTENTION IS DIRECTED TO THE POSSIBILITY OF EXISTING PRIVATE SPRINKLERS AND LIGHTING SYSTEMS WITHIN THE RIGHT-OF-WAY, WHICH ARE NOT SHOWN ON THE PLAN. LOCATING, WORKING AROUND AND PROTECTING THESE SYSTEMS SHALL BE COMPLETED AT NO EXTRA COST TO THE CITY.
9. AT ALL LOCATIONS WHERE THE PROPOSED WATERMAIN CROSSES UNDER OR ABOVE THE EXISTING TOP OF THE UPPER PIPE GRANULAR A TO BE COMPACTED TO MINIMUM 98% OF MAXIMUM FRT DENSITY.
10. CONTRACTOR TO PROVIDE ADEQUATE SUPPORT DURING CONSTRUCTION BETWEEN THE NEW WATERMAIN AND EXISTING GAS MAIN LINES THAN 300mm IN DIAMETER. MAINTAIN 600mm MINIMUM VERTICAL CLEARANCE BETWEEN THE NEW WATERMAIN AND EXISTING GAS MAINS EQUAL TO OR GREATER THAN 300mm IN DIAMETER.
11. ALL EXISTING WATERMAINS AND SEWER PIPES LARGER THAN 300mm DIAMETER SHALL BE SUPPORTED ACCORDING TO CITY STANDARDS.
12. ALL DIMENSIONS ARE EXPRESSED IN METERS (m) AND PIPE SIZES ARE EXPRESSING IN MILLIMETERS (mm) UNLESS OTHERWISE NOTED.
13. THE APPLICANT IS REQUIRED TO COMPLY WITH THE SEWER USE BY-LAW AND OBTAIN ALL APPROVALS;PERMITS FROM CITY STAFF.
14. THE APPLICANT IS RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE PROVINCIAL REQUIREMENTS AND OBTAINING THE NECESSARY APPROVALS AND/OR PERMITS FROM THE MINISTRY OF ENVIRONMENT & CLIMATE CHANGE WITH REGARD TO ANY PROPOSED DEWATERING.

NOTE:

ALL DIMENSIONS AND ELEVATIONS MUST BE SITE MEASURED AND CONFIRMED PRIOR TO FABRICATION AND/OR ERECTION.

SHOP DRAWINGS

ALL SHOP DRAWINGS SUBMITTED TO THE ENGINEER SHALL BE REVIEWED FOR GENERAL COMPLIANCE WITH THE INTENT OF THE STRUCTURAL DESIGN CONTAINED WITHIN THESE PROJECT DOCUMENTS ONLY.

DO NOT SUBMIT SHOP DRAWINGS AND/OR COVERING TRANSMITTALS MARKED 'FOR APPROVAL'. AFOREMENTIONED DOCUMENTS SO MARKED WILL NOT BE REVIEWED.

THESE DRAWINGS ARE THE PROPERTY OF ROBERT E. DALE LIMITED, CONSULTING ENGINEERS AND SHALL NOT BE USED AND OR REPLICATED IN THE GENERATION OF SHOP DRAWING PURPOSES.

NO.	REVISION	DATE
A	PRELIMINARY--ISSUED WITH CIVIL BRIEF	06/02/2023

STAGE OF DESIGN AND DRAFTING:

■	Issued for Site Plan Approvals	
	Preliminary Design	
	Issued for Comments and Coordination	
	Issued for Building Permit	
	Issued for Tender	
	Issued for Construction	
	As Built Record Set	

ROBERT E. DALE LIMITED
CONSULTING ENGINEERS

ENGINEERING DONE UPRIGHT.

429 EXMOUTH STREET
SUITE 208, SARNIA,
O N T A R I O

not valid unless signed

PROJECT
SITE PLAN/CIVIL DESIGN FOR 3151 MONTROSE ROAD NIAGARA FALLS, ONTARIO

ARCHITECT:

DWG. TITLE
SITE SERVICING PLAN

DATE	MAY 25 2023	SCALE	1:200 METRIC
DESIGNED BY	G.DALE	DRAWING No.:	CVL-2
DRAWN BY	W.J.REED		
PROJ. No.	230384		

SANITARY SEWER DESIGN SHEET

Project / Subdivision : 3151 Montrose

Consulting Engineer : Robert E. Dale Limited

Project No.: 230384

Prepared by: G.Dale

Checked by:

Last Revised: May-23

Design Parameters

Residential Density (Single+Semis) =	3.5 cap/unit	Residential =	370 L/cap/day
Residential Density (Town Houses) =	2.9 cap/unit	Industrial (Light) =	35 m^3/ha/day
Residential Density (Apartments) =	4.0 cap/unit	Industrial (Heavy)=	55 m^3/ha/day
Manning 'n' =	0.013	Institutional =	65 m^3/ha/day
Extran. Flow=	0.21 L/s/ha	Commercial =	65 m^3/ha/day

Design Equations

$$M(r) = \frac{1+\frac{14}{4+(P)^{1/2}}}{}$$

$$M(ind) = 6.6604 \times A^{-0.1992}$$

$$Q(i) = i \times cr \times A$$

$$Q(r) = \frac{P \cdot q \cdot M}{86400}$$

NOTE: The pipe capacity is limited to maximum values according to Table E-1 of the Design Manual.

Notes/Comments:

Location					Individual Values									Cumulative Values									Flow Data							Sewer Data						
Street	From		To		Industrial Light Area	Industrial Heavy Area	Commercial Area	Institutional Area	Residential Area	Residential Units (Single+Semis)	Residential Units (Town Houses)	Residential Units (Apartments)	Residential Population	Light Industrial P.F.	Heavy Industrial P.F.	Industrial Light Area	Industrial Heavy Area	Commercial Area	Institutional Area	Residential P.F.	Residential Area	Residential Population	Light Industrial Peak Flow (L/s)	Heavy Industrial Peak Flow (L/s)	Commercial Peak Flow (L/s)	Institutional Peak Flow (L/s)	Population Peak Flow (L/s)	Peak Extraneous Flow (L/s)	Total Design Flow (L/s)	Length	Pipe Size	Type of Pipe	Grade	Full Flow Capacity	Full Flow Velocity	Actual Velocity
	MH #	Inv	MH #	Inv	(ha)	(ha)	(ha)	(ha)	(ha)	#	#	#	cap.	M(ind-L)	M(ind-H)	A(ind-L)	A(ind-H)	A(c)	A(ins)	M(r)	A(r)	P	Q(l-ind)	Q(h-ind)	Q(c)	Q(ins)	Q(r)	Q(i)	Q(d)	(m)	(mm)		(%)	(L/s)	(m/s)	(m/s)
3151 Montrose	MH4	S	MH2	N							5		15							4.00		15.0					0.26		0.26	49.0	200	PVC	0.40	21.64	0.67	0.22
	Mh3	S	MH2	N						1	5		18							4.00		18.0					0.31		0.31	46.0	200	PVC	0.40	21.64	0.67	0.24
										2	10		36							4.00		36.0					0.62		0.62	46.0	200	PVC	0.40	21.64	0.67	0.29

Location					Individual Values									Cumulative Values									Flow Data							Sewer Data						
Street	From		To		Industrial Light Area	Industrial Heavy Area	Commercial Area	Institutional Area	Residential Area	Residential Units (Single+Semis)	Residential Units (Town Houses)	Residential Units (Apartments)	Residential Population	Light Industrial P.F.	Heavy Industrial P.F.	Industrial Light Area	Industrial Heavy Area	Commercial Area	Institutional Area	Residential P.F.	Residential Area	Residential Population	Light Industrial Peak Flow (L/s)	Heavy Industrial Peak Flow (L/s)	Commercial Peak Flow (L/s)	Institutional Peak Flow (L/s)	Population Peak Flow (L/s)	Peak Extraneous Flow (L/s)	Total Design Flow (L/s)	Length	Pipe Size	Type of Pipe	Grade	Full Flow Capacity	Full Flow Velocity	Actual Velocity
	MH #	Inv	MH #	Inv	(ha)	(ha)	(ha)	(ha)	(ha)	#	#	#	cap.	M(ind-L)	M(ind-H)	A(ind-L)	A(ind-H)	A(c)	A(ins)	M(r)	A(r)	P	Q(l-ind)	Q(h-ind)	Q(c)	Q(ins)	Q(r)	Q(i)	Q(d)	(m)	(mm)		(%)	(L/s)	(m/s)	(m/s)

REQUIRED FIRE FLOW

Water Supply for Public Fire Protection (FUS 1999)

Project	3151 Montrose
Project #	230384
Designer	G.Dale
Address	Niagara Falls, Ontario
Description	Fire Flows - Per Unit

= 220 × ×

F = Required fire flow (LPM)
C = Coefficient related to type of construction
A = Total floor area (including all storeys but excluding any basement levels at least 50% below grade)

Type of Construction	Fire-Resistive Construction	**C =**	0.8
Description	**Fully Protected Frame, Roof, Floors. Minimum 3 Hour Rated Structural Members and Floors with Reinforced Concrete or Protected Steel**		

Floor Area	607.5	m²	1237.5
# Storeys	1		
Fire Resistant Building?	Non		

Vertical Openings and Exterior Vertical Communications protected with minimum one (1) hr rating? NO

Area	**1237.5**	m²	35.17812
Description	Area of two largest floors + 50% of each of the floors above it (max 8)		6191.349
Required Fire Flow	**10723**	L/min	

Occupancy Charge	Combustible			
Fire Flow Reduction	**0**	**OR**	**0.00**	L/min
Required Fire Flow	**6191.00**	L/min		

Automated Sprinker Protection					NO	
Designed to NFPA 13 Standard					NON	0%
Standard Water Supply to Sprinklers and Standpipes					NO	0%
Fully Supervised System					NO	0
Fire Flow Adjustment					**0**	L/min
Exposure 1 (North)	**Distance**	5	m	**Charge**	**20%**	
Description						
Exposure 2 (East)	**Distance**	5	m	**Charge**	**20%**	
Description						
Exposure 3 (West)	**Distance**	5	m	**Charge**	**20%**	
Description						
Exposure 4 (South)	**Distance**	5	m	**Charge**	**20%**	
Description						

Total Exposure Charge	**80%**	
Fire Flow Adjustment	**4952.800**	L/min
Total Required Fire Flow	**11143.800**	L/min
Total Required Fire Flow	**2941.96**	U.S. GPM
Total Required Fire Flow	**185.73**	L/s
Total Required Fire Flow	**2005884**	L/3 hour
Total Required Fire Flow	**2006**	m3/3 hour

FIRE FLOW DEMAND REQUIREMENTS - FIRE UNDERWRITERS SURVEY (FUS GUIDELINES)

Fire flow demands for the FUS method is based on information and guidance provided in "Water Supply for Public Protection" (Fire Underwriters Survey, 1999).

An estimate of the fire flow required is given by the following formula:

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

where:

F = the required fire flow in litres per minute
C = coefficient related to the type of construction
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls)
= 0.6 for fire-resistive construction (fully protected frame, floors, roof)
A = Total floor area in square metres

Adjustments to the calculated fire flow can be made based on occupancy, sprinkler protection and exposure to other structures. The table below summarizes the adjustments made to the basic fire flow demand.

(2) Occupancy	
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	No charge
Free Burning	15%
Rapid Burning	25%

(3) Sprinkler
30% credit for adequately designed system per NFPA 13. Additional 10% if water supply standard for both the system and fire department hose lines.

(4) Exposure		
0 to 3m	25%	
3.1 to 10m	20%	Calculate for all
10.1 to 20m	15%	sides. Maximum
20.1 to 30m	10%	charge shall not
30.1 to 45m	5%	exceed 75%

5 Year

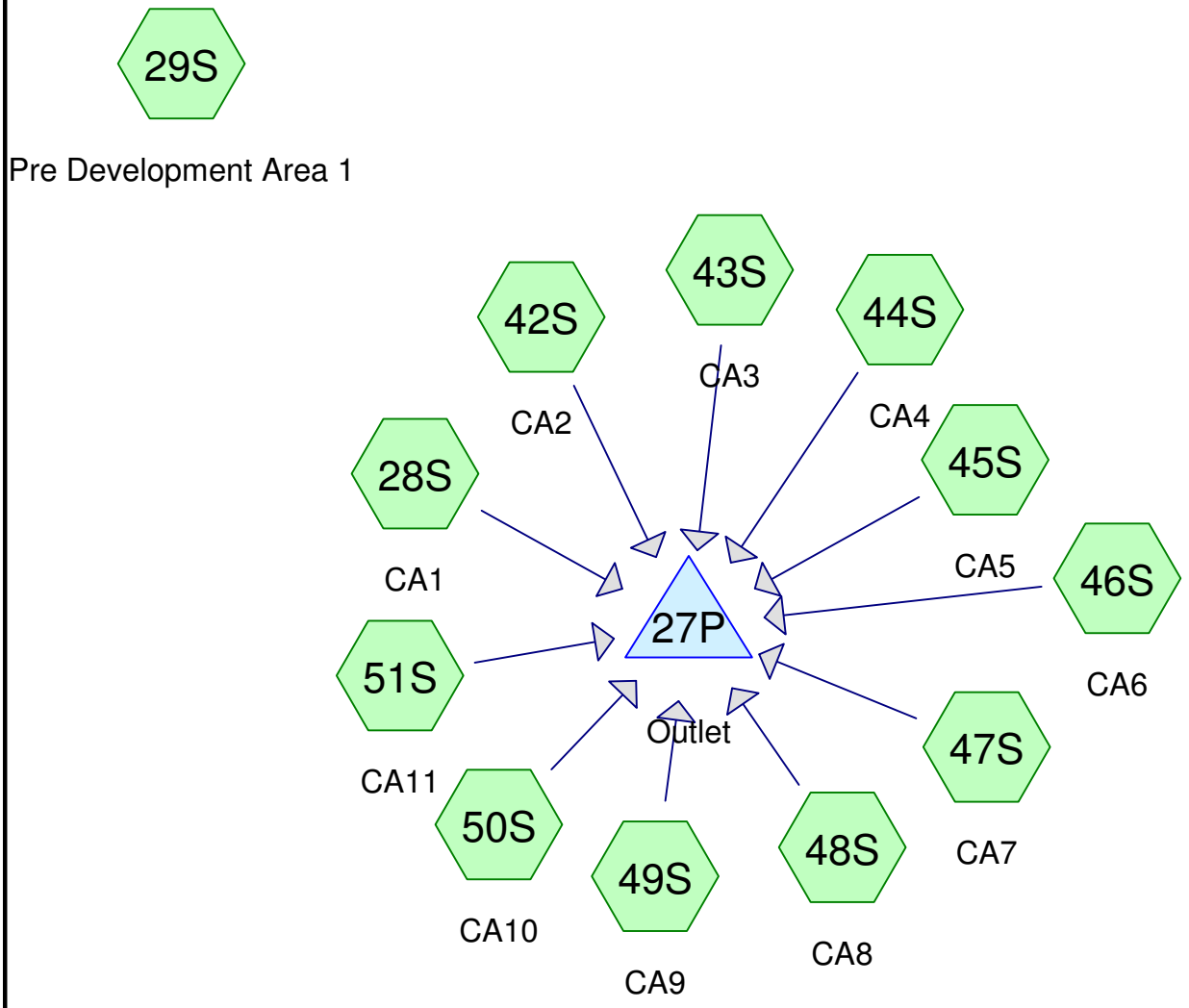
A = 2667
B = 20
C = 1
Runoff Coefficient Adjustment = 1

ROBERT E. DALE LIMITED
STORM SEWER DESIGN SHEET (v1.0)
3151 MONTROSE
June 2, 2023

Acceptable
Review
Incorrect

File No: 23-0384
Design Sheet: STORM
Calculated By: G.DALE
Checked By: R.DALE

Catchment Area	Street Name	Maintenance Hole Number		Runoff Calculations										Hydraulic Calculations						
				Runoff Coefficent C	Runoff Coefficient w/ Adjustment C'	Area A	Incremental C'*A	Total C'*A	Time of Concentration		Intensity	Total Q		Diameter	Mannings N	Length	Slope	Q_{pipe}	Velocity	Capacity Check Q / Q_{pipe}
		From	To			Ha			Total minutes	Flow Time In Pipe minutes	mm/hr	m^3/s		mm		m	%	m^3/s	m/s	%
Stm1	3151 Montrose	Mh4	Mh2	0.750	0.750	0.141	0.106	0.106	10.000	0.696	88.900	0.026		250	0.013	32.000	0.400	0.038	0.766	69.5%
Stm2	3151 Montrose	RLCB	CB	0.750	0.750	0.063	0.047	0.047	10.000	0.841	88.900	0.012		200	0.013	38.000	0.520	0.024	0.753	49.3%
		CB	MH2	0.750	0.750	0.026	0.020	0.067	10.000	0.841	88.900	0.017		200	0.013	38.000	0.520	0.024	0.753	69.9%
Stm3	3151 Montrose	CB	MH3	0.750	0.750	0.053	0.040	0.040	10.000	0.376	88.900	0.010		200	0.013	17.000	0.520	0.024	0.753	41.3%
		MH2	MH2	0.750	0.750	0.158	0.118	0.158	10.000	0.878	88.900	0.039		250	0.013	46.000	0.520	0.043	0.874	90.9%
CA10	3151 Montrose	RLCB	MH1	0.750	0.750	0.078	0.058	0.058	10.000	0.376	88.900	0.014		200	0.013	17.000	0.520	0.024	0.753	60.8%
Overall	3151 Montrose	MH2	MH1	0.750	0.750	0.561	0.421	0.421	10.000	0.498	88.900	0.104		375	0.013	30.000	0.400	0.111	1.004	93.7%



Subcat Reach Pond Link

Routing Diagram for 230384 Swmm
Prepared by Robert E Dale Limited, Printed 6/2/2023

Project Notes

Copied 2 events from Sample D 24-hr storm
Copied 2 events from Whitby Chicago Storm storm
Copied 5 events from Canada-ON Niagra Falls storm
Copied 6 events from Canada-St.Catharines 24-hr storm
Copied 6 events from Canada-Sarnia 24-hr storm
Copied 5 events from Canada-ON Niagra Falls storm
Copied 6 events from Canada-St.Catharines 24-hr storm
Copied 5 events from Canada-ON Niagra Falls storm
Copied 3 events from Canada-Fort Erie storm

Area Listing (all nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
5,611.0	0.60	Existing Single Family (29S)
5,611.0	0.75	Row Housing (28S, 42S, 43S, 44S, 45S, 46S, 47S, 48S, 49S, 50S, 51S)
11,222.0	**0.68**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-meters)	Soil Group	Subcatchment Numbers
0.0	HSG A	
0.0	HSG B	
0.0	HSG C	
0.0	HSG D	
11,222.0	Other	28S, 29S, 42S, 43S, 44S, 45S, 46S, 47S, 48S, 49S, 50S, 51S
11,222.0		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover	Subcatchm Numbers
0.0	0.0	0.0	0.0	5,611.0	5,611.0	Existing Single Family	
0.0	0.0	0.0	0.0	5,611.0	5,611.0	Row Housing	
0.0	**0.0**	**0.0**	**0.0**	**11,222.0**	**11,222.0**	**TOTAL AREA**	

Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 28S: CA1 Runoff Area=629.7 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0101 m³/s 6.2 m³

Subcatchment 29S: Pre Development Area 1 Runoff Area=5,611.0 m² 0.00% Impervious Runoff Depth=8 mm
Tc=10.0 min C=0.60 Runoff=0.0723 m³/s 44.2 m³

Subcatchment 42S: CA2 Runoff Area=717.0 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0116 m³/s 7.1 m³

Subcatchment 43S: CA3 Runoff Area=693.8 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0112 m³/s 6.8 m³

Subcatchment 44S: CA4 Runoff Area=528.4 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0085 m³/s 5.2 m³

Subcatchment 45S: CA5 Runoff Area=225.0 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0036 m³/s 2.2 m³

Subcatchment 46S: CA6 Runoff Area=319.3 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0051 m³/s 3.1 m³

Subcatchment 47S: CA7 Runoff Area=373.6 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0060 m³/s 3.7 m³

Subcatchment 48S: CA8 Runoff Area=658.3 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0106 m³/s 6.5 m³

Subcatchment 49S: CA9 Runoff Area=262.9 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0042 m³/s 2.6 m³

Subcatchment 50S: CA10 Runoff Area=776.9 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0125 m³/s 7.6 m³

Subcatchment 51S: CA11 Runoff Area=426.1 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.75 Runoff=0.0069 m³/s 4.2 m³

Pond 27P: Outlet Peak Elev=193.504 m Storage=39.7 m³ Inflow=0.0904 m³/s 55.2 m³
Outflow=0.0193 m³/s 55.2 m³

Total Runoff Area = 11,222.0 m² Runoff Volume = 99.3 m³ Average Runoff Depth = 9 mm
100.00% Pervious = 11,222.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 28S: CA1

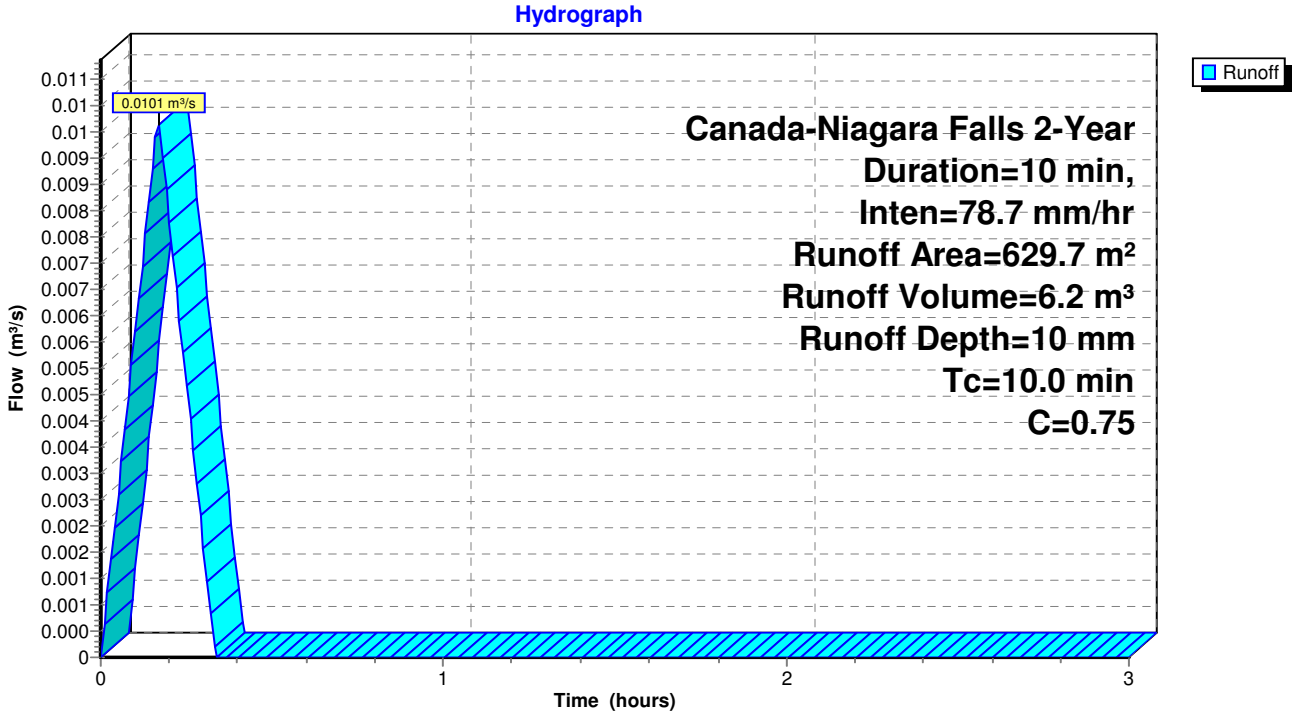
Runoff = 0.0101 m³/s @ 0.17 hrs, Volume= 6.2 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
629.7	0.75	Row Housing
629.7		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 28S: CA1



Summary for Subcatchment 29S: Pre Development Area 1

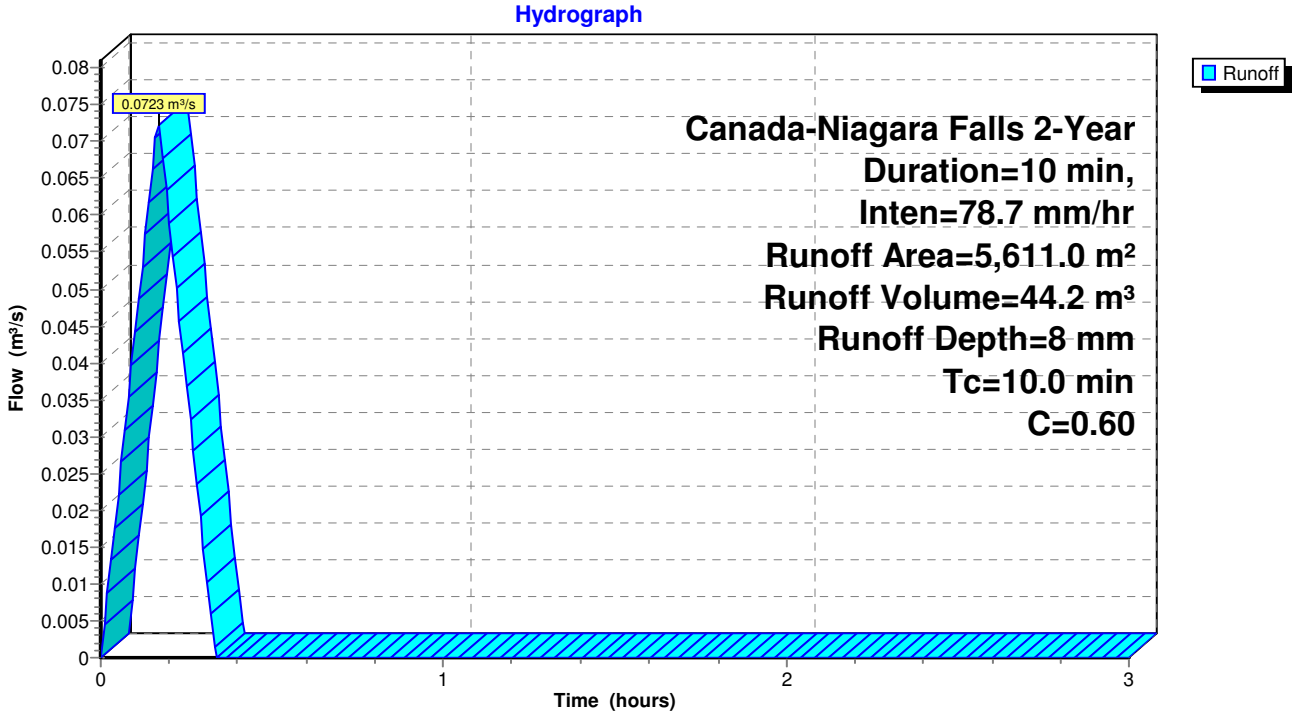
Runoff = 0.0723 m³/s @ 0.17 hrs, Volume= 44.2 m³, Depth= 8 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
5,611.0	0.60	Existing Single Family
5,611.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 29S: Pre Development Area 1



Summary for Subcatchment 42S: CA2

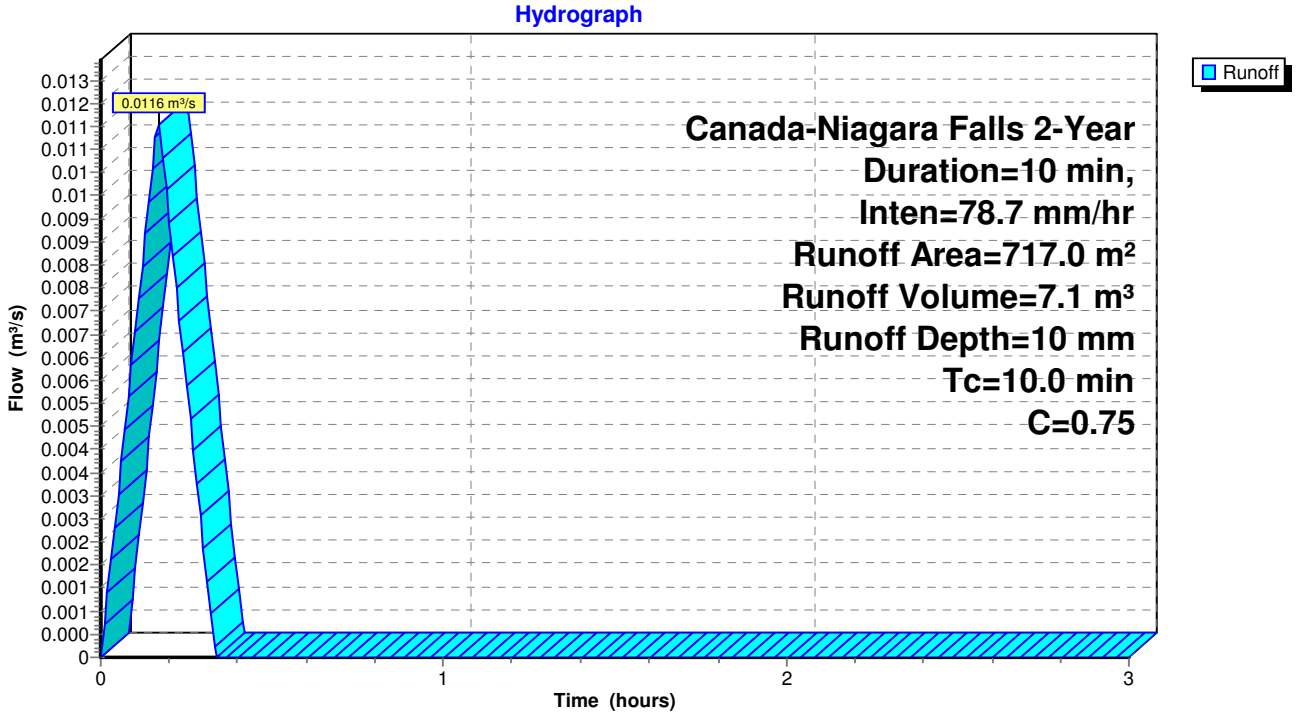
Runoff = 0.0116 m³/s @ 0.17 hrs, Volume= 7.1 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
717.0	0.75	Row Housing
717.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 42S: CA2



Summary for Subcatchment 43S: CA3

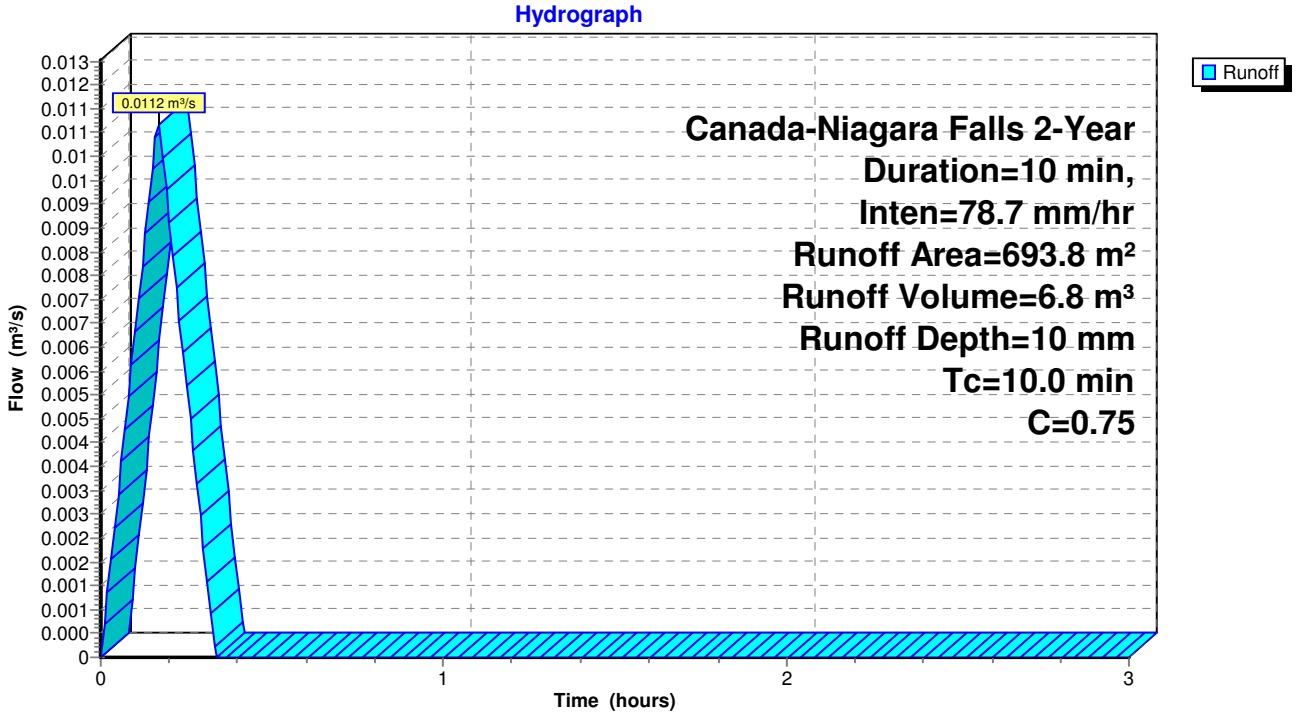
Runoff = 0.0112 m³/s @ 0.17 hrs, Volume= 6.8 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
693.8	0.75	Row Housing
693.8		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 43S: CA3



Summary for Subcatchment 44S: CA4

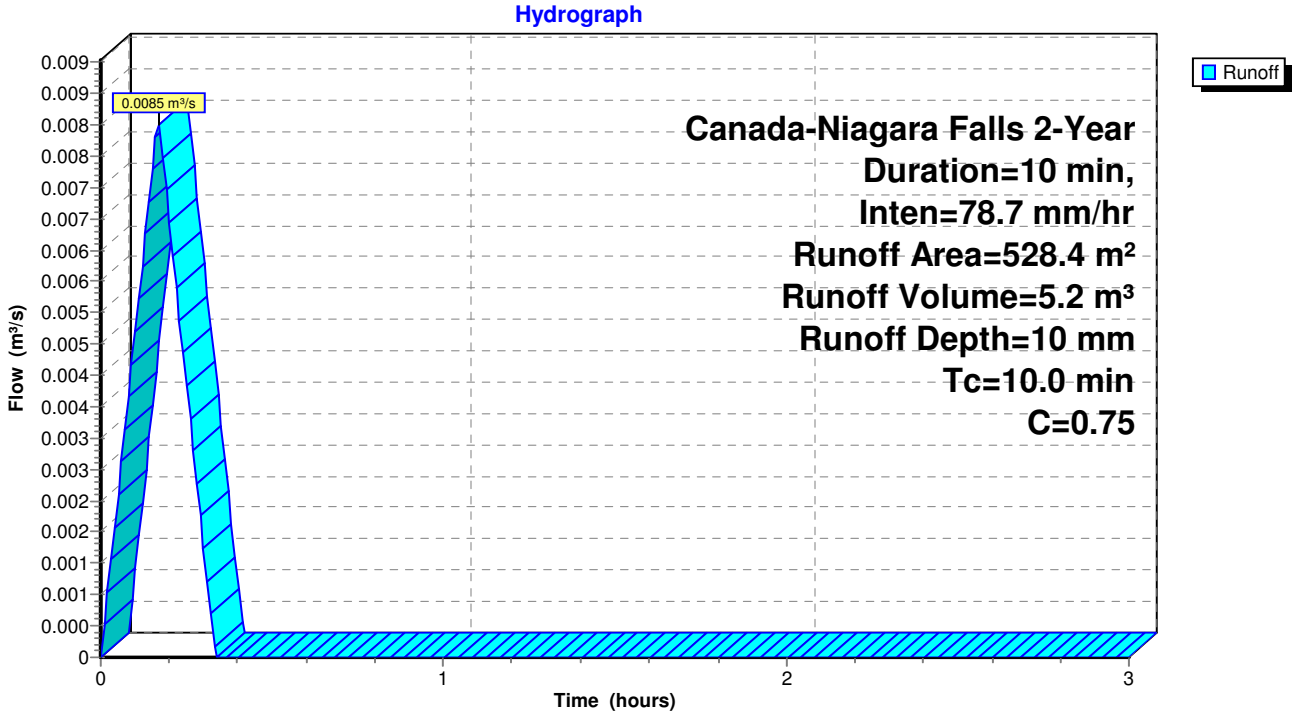
Runoff = 0.0085 m³/s @ 0.17 hrs, Volume= 5.2 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
528.4	0.75	Row Housing
528.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 44S: CA4



Summary for Subcatchment 45S: CA5

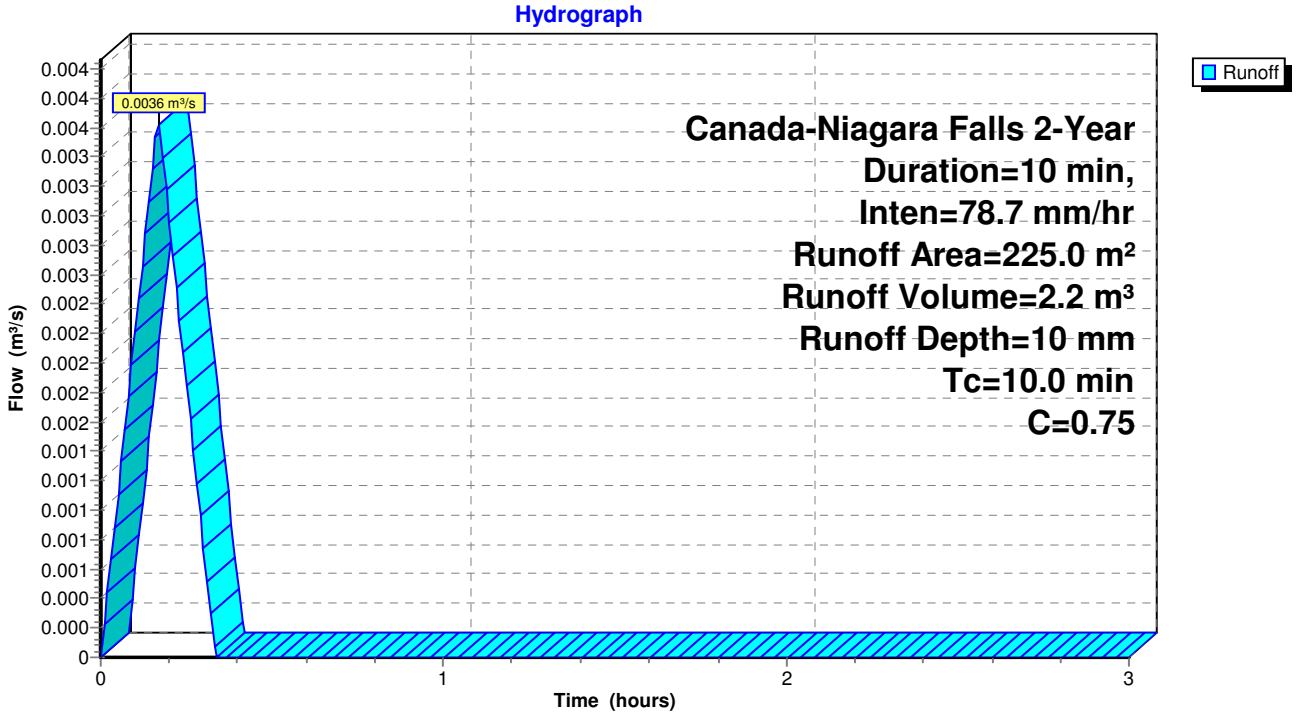
Runoff = 0.0036 m³/s @ 0.17 hrs, Volume= 2.2 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
225.0	0.75	Row Housing
225.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 45S: CA5



Summary for Subcatchment 46S: CA6

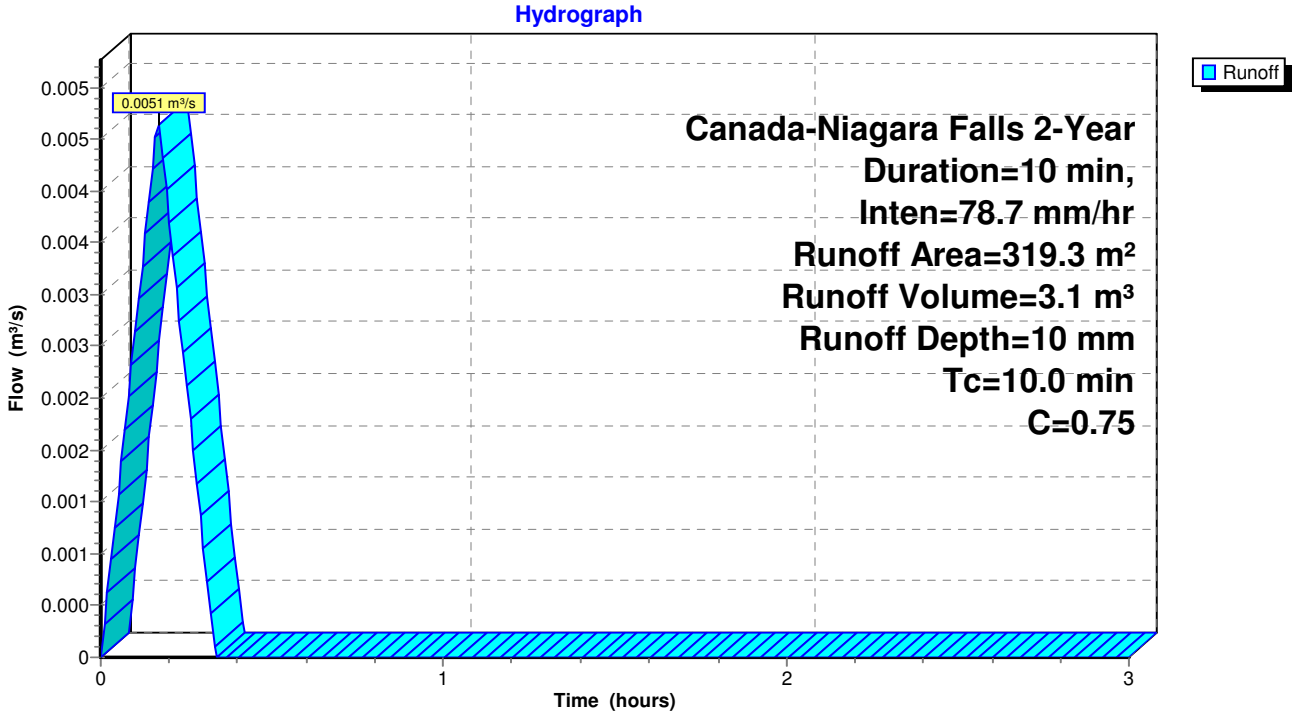
Runoff = 0.0051 m³/s @ 0.17 hrs, Volume= 3.1 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
319.3	0.75	Row Housing
319.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 46S: CA6



Summary for Subcatchment 47S: CA7

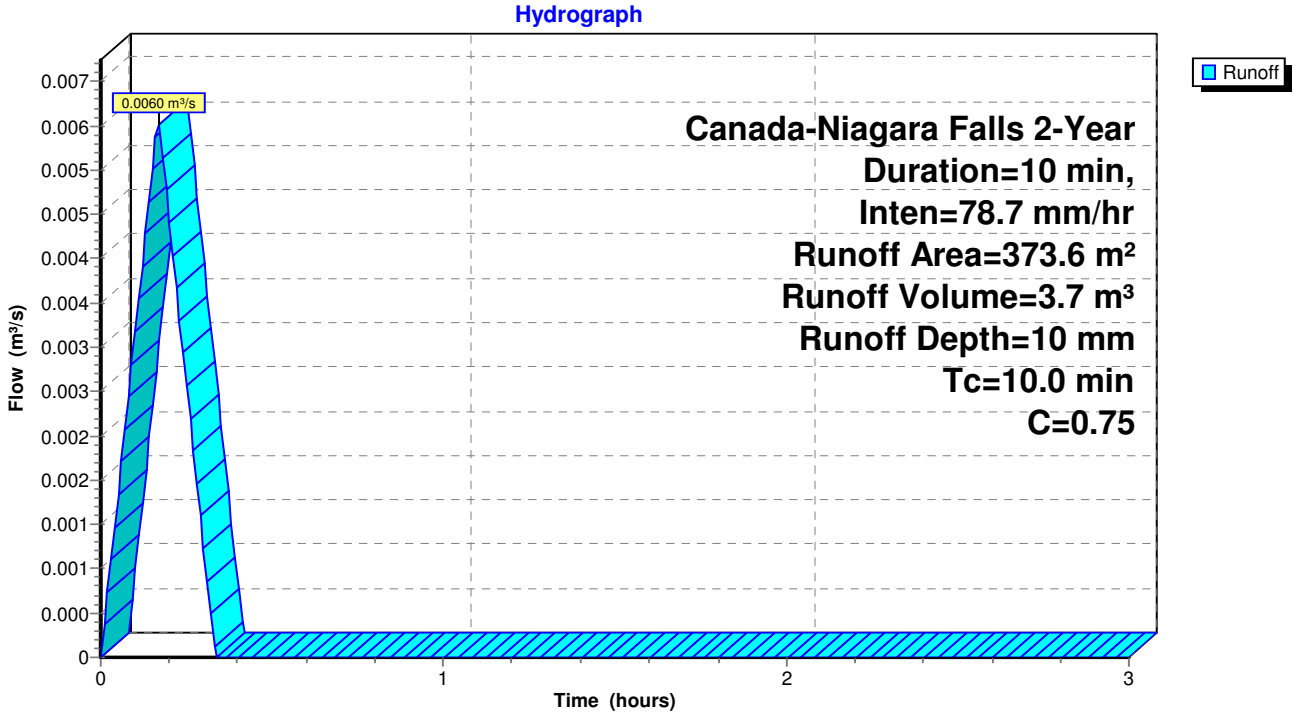
Runoff = 0.0060 m³/s @ 0.17 hrs, Volume= 3.7 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
373.6	0.75	Row Housing
373.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 47S: CA7



Summary for Subcatchment 48S: CA8

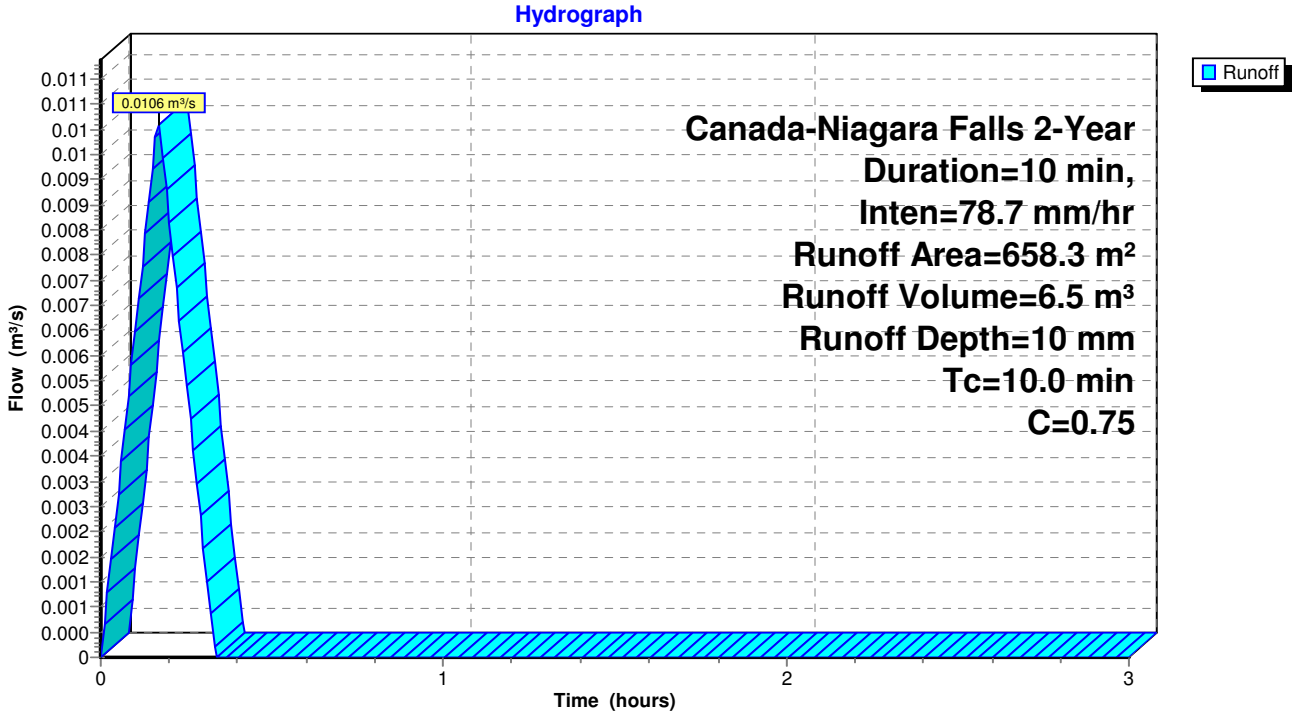
Runoff = 0.0106 m³/s @ 0.17 hrs, Volume= 6.5 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
658.3	0.75	Row Housing
658.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 48S: CA8



Summary for Subcatchment 49S: CA9

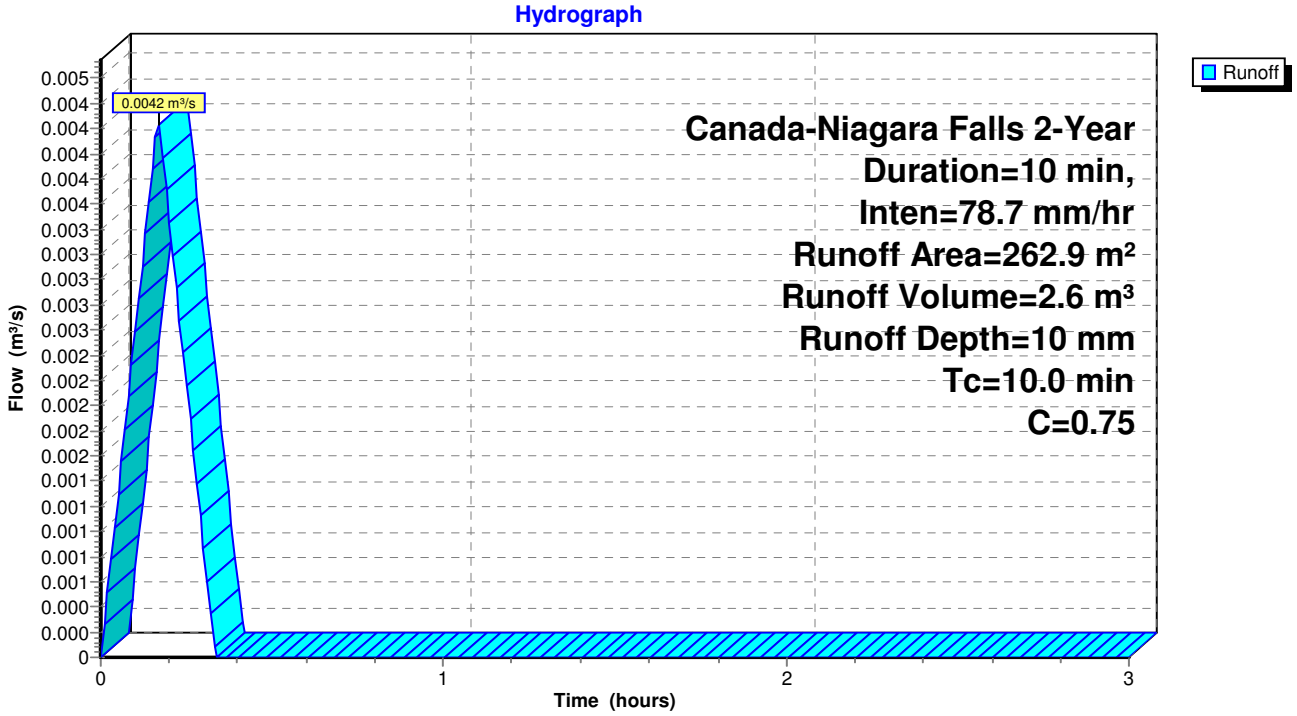
Runoff = 0.0042 m³/s @ 0.17 hrs, Volume= 2.6 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
262.9	0.75	Row Housing
262.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 49S: CA9



Summary for Subcatchment 50S: CA10

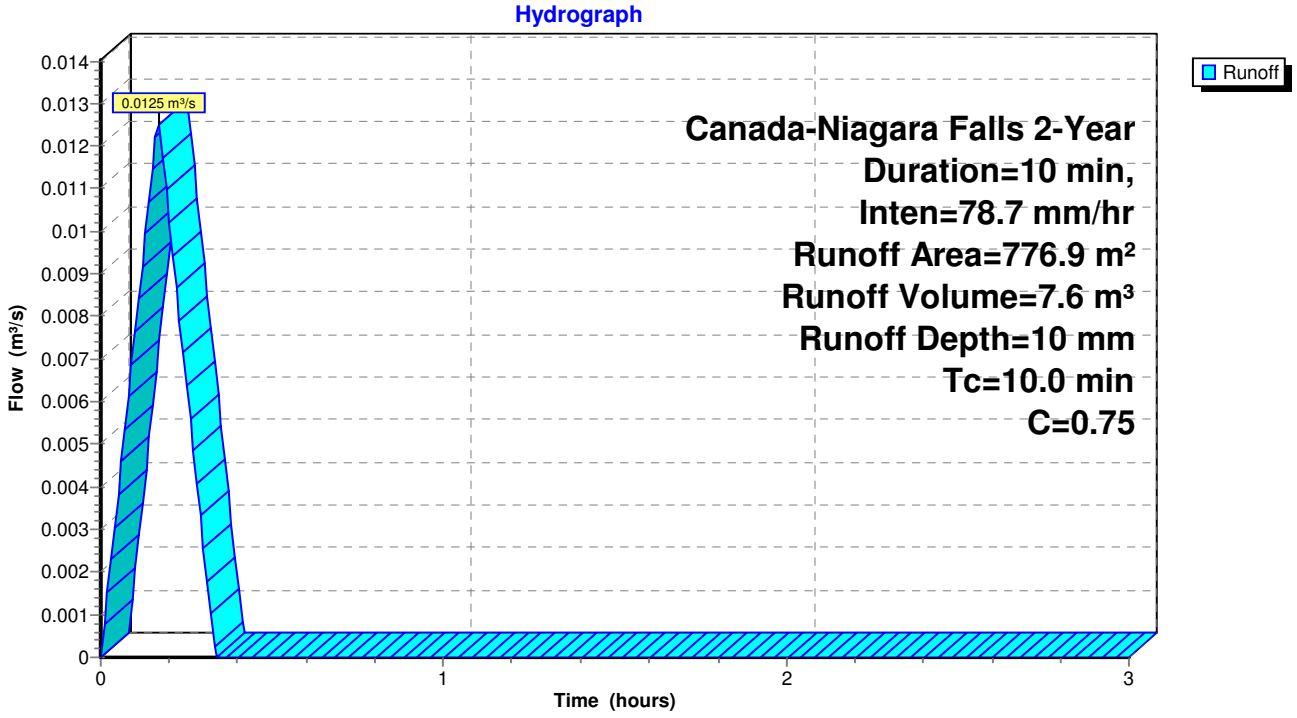
Runoff = 0.0125 m³/s @ 0.17 hrs, Volume= 7.6 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
776.9	0.75	Row Housing
776.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 50S: CA10



Summary for Subcatchment 51S: CA11

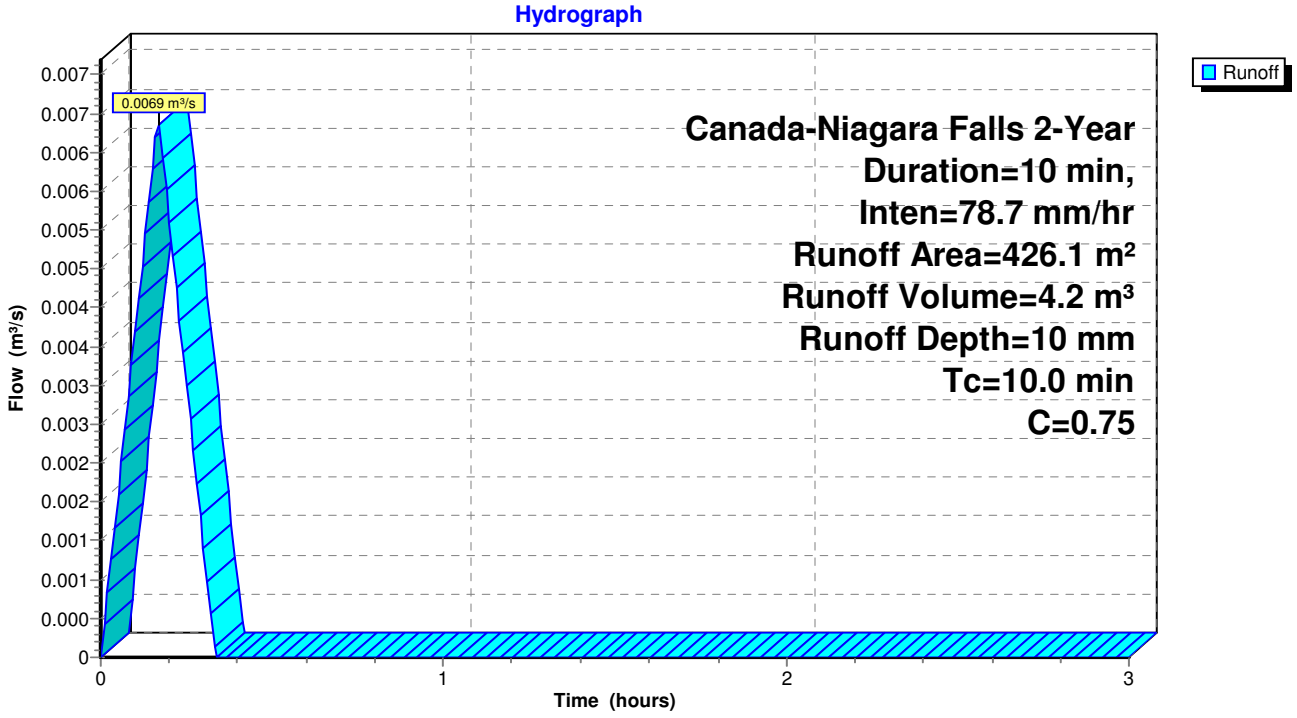
Runoff = 0.0069 m³/s @ 0.17 hrs, Volume= 4.2 m³, Depth= 10 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 2-Year Duration=10 min, Inten=78.7 mm/hr

Area (m²)	C	Description
426.1	0.75	Row Housing
426.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 51S: CA11



Summary for Pond 27P: Outlet

Inflow Area = 5,611.0 m², 0.00% Impervious, Inflow Depth = 10 mm for 2-Year event
Inflow = 0.0904 m³/s @ 0.17 hrs, Volume= 55.2 m³
Outflow = 0.0193 m³/s @ 0.30 hrs, Volume= 55.2 m³, Atten= 79%, Lag= 7.9 min
Primary = 0.0193 m³/s @ 0.30 hrs, Volume= 55.2 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 193.504 m @ 0.30 hrs Surf.Area= 16.2 m² Storage= 39.7 m³
Flood Elev= 194.600 m Surf.Area= 728.8 m² Storage= 117.3 m³

Plug-Flow detention time= 22.3 min calculated for 55.2 m³ (100% of inflow)
Center-of-Mass det. time= 22.1 min (32.1 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	194.400 m	12.3 m³	**Ponding Area 1 (Prismatic)** Listed below (Recalc)
#2	194.500 m	6.2 m³	**Ponding Area 2 (Prismatic)** Listed below (Recalc)
#3	194.500 m	6.2 m³	**Ponding Area 3 (Prismatic)** Listed below (Recalc)
#4	194.450 m	4.1 m³	**Ponding Area 5 (Prismatic)** Listed below (Recalc)
#5	194.400 m	18.4 m³	**Ponding Area 4 (Prismatic)** Listed below (Recalc)
#6	194.200 m	22.5 m³	**Ponding Area 6 (Prismatic)** Listed below (Recalc)
#7	192.680 m	7.1 m³	**600 mm Round Pipe Storage** L= 25.00 m S= 0.0040 m/m
#8	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#9	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#10	192.800 m	7.7 m³	**1.20 mD x 1.70 mH mh** x 4
#11	192.600 m	6.8 m³	**0.60 mD x 2.40 mH Catcbasin** x 10
		118.4 m³	Total Available Storage

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	122.4	12.3	12.3

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

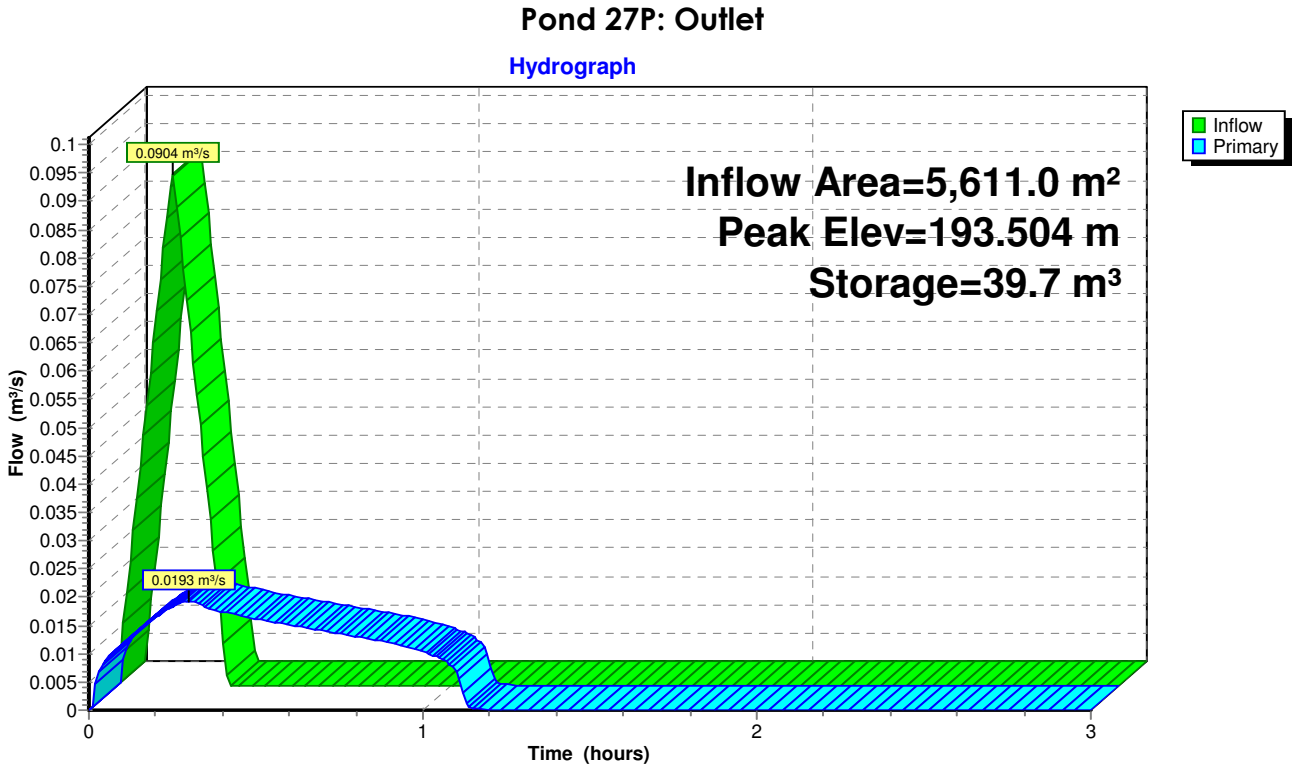
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.450	0.3	0.0	0.0
194.600	55.0	4.1	4.1

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	184.0	18.4	18.4

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.200	0.3	0.0	0.0
194.600	112.0	22.5	22.5

Device	Routing	Invert	Outlet Devices
#1	Primary	192.600 m	**100 mm Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.0193 m³/s @ 0.30 hrs HW=193.503 m (Free Discharge)
↑1=Orifice/Grate (Orifice Controls 0.0193 m³/s @ 2.46 m/s)



Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 28S: CA1 Runoff Area=629.7 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0134 m³/s 8.2 m³

Subcatchment 29S: Pre Development Area Runoff Area=5,611.0 m² 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.60 Runoff=0.0958 m³/s 58.5 m³

Subcatchment 42S: CA2 Runoff Area=717.0 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0153 m³/s 9.3 m³

Subcatchment 43S: CA3 Runoff Area=693.8 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0148 m³/s 9.0 m³

Subcatchment 44S: CA4 Runoff Area=528.4 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0113 m³/s 6.9 m³

Subcatchment 45S: CA5 Runoff Area=225.0 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0048 m³/s 2.9 m³

Subcatchment 46S: CA6 Runoff Area=319.3 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0068 m³/s 4.2 m³

Subcatchment 47S: CA7 Runoff Area=373.6 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0080 m³/s 4.9 m³

Subcatchment 48S: CA8 Runoff Area=658.3 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0140 m³/s 8.6 m³

Subcatchment 49S: CA9 Runoff Area=262.9 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0056 m³/s 3.4 m³

Subcatchment 50S: CA10 Runoff Area=776.9 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0166 m³/s 10.1 m³

Subcatchment 51S: CA11 Runoff Area=426.1 m² 0.00% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.75 Runoff=0.0091 m³/s 5.6 m³

Pond 27P: Outlet Peak Elev=194.415 m Storage=53.4 m³ Inflow=0.1198 m³/s 73.1 m³
Outflow=0.0277 m³/s 73.1 m³

Total Runoff Area = 11,222.0 m² Runoff Volume = 131.6 m³ Average Runoff Depth = 12 mm
100.00% Pervious = 11,222.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 28S: CA1

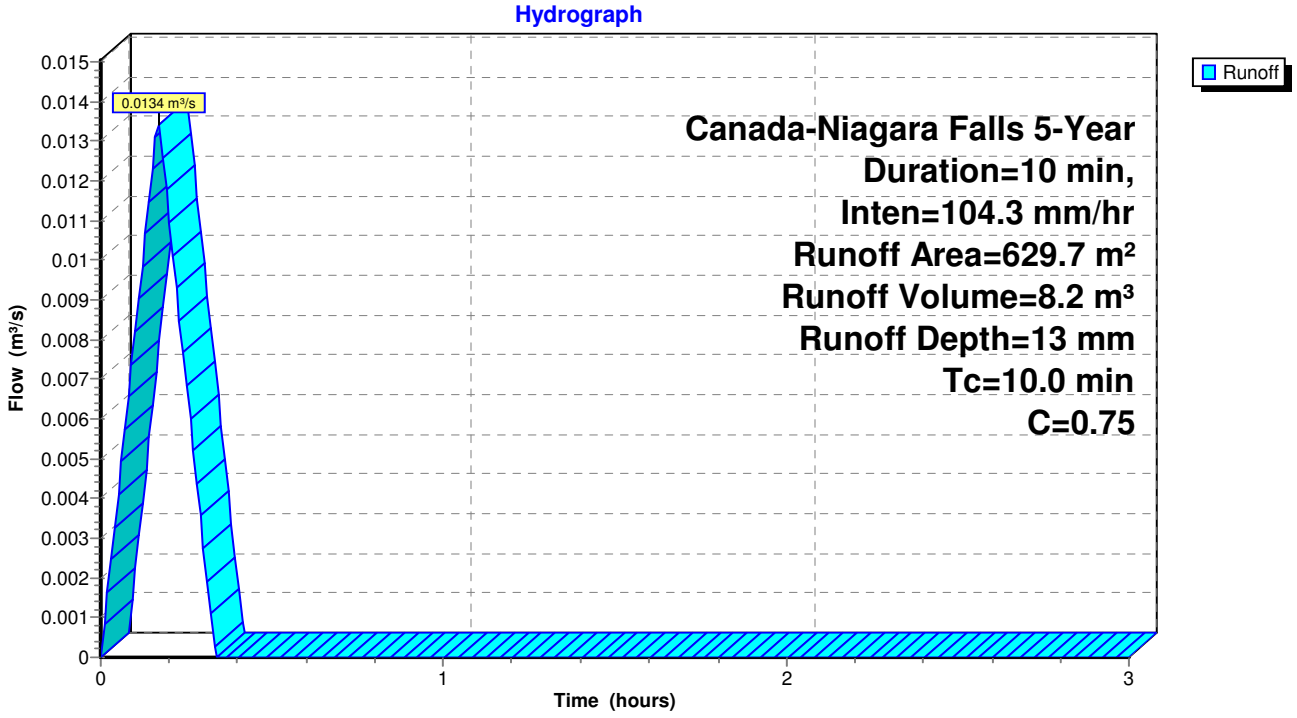
Runoff = 0.0134 m³/s @ 0.17 hrs, Volume= 8.2 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
629.7	0.75	Row Housing
629.7		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 28S: CA1



Summary for Subcatchment 29S: Pre Development Area 1

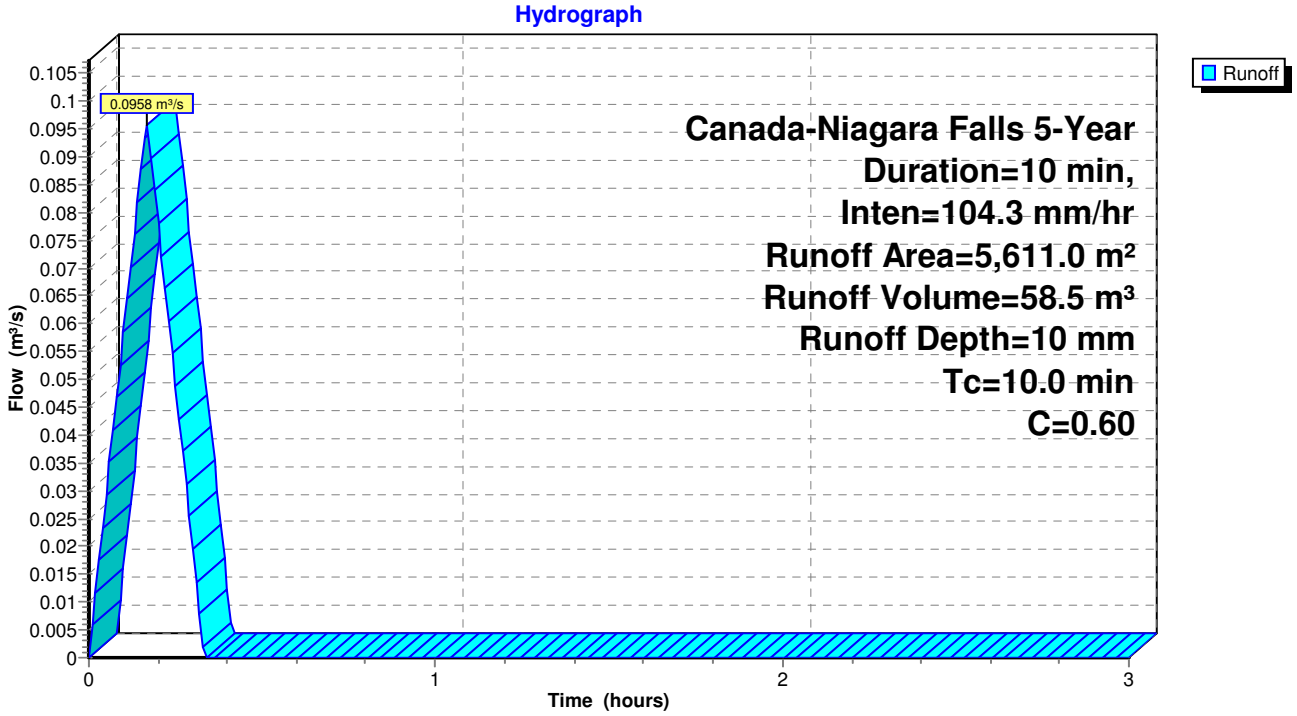
Runoff = 0.0958 m³/s @ 0.17 hrs, Volume= 58.5 m³, Depth= 10 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
5,611.0	0.60	Existing Single Family
5,611.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 29S: Pre Development Area 1



Summary for Subcatchment 42S: CA2

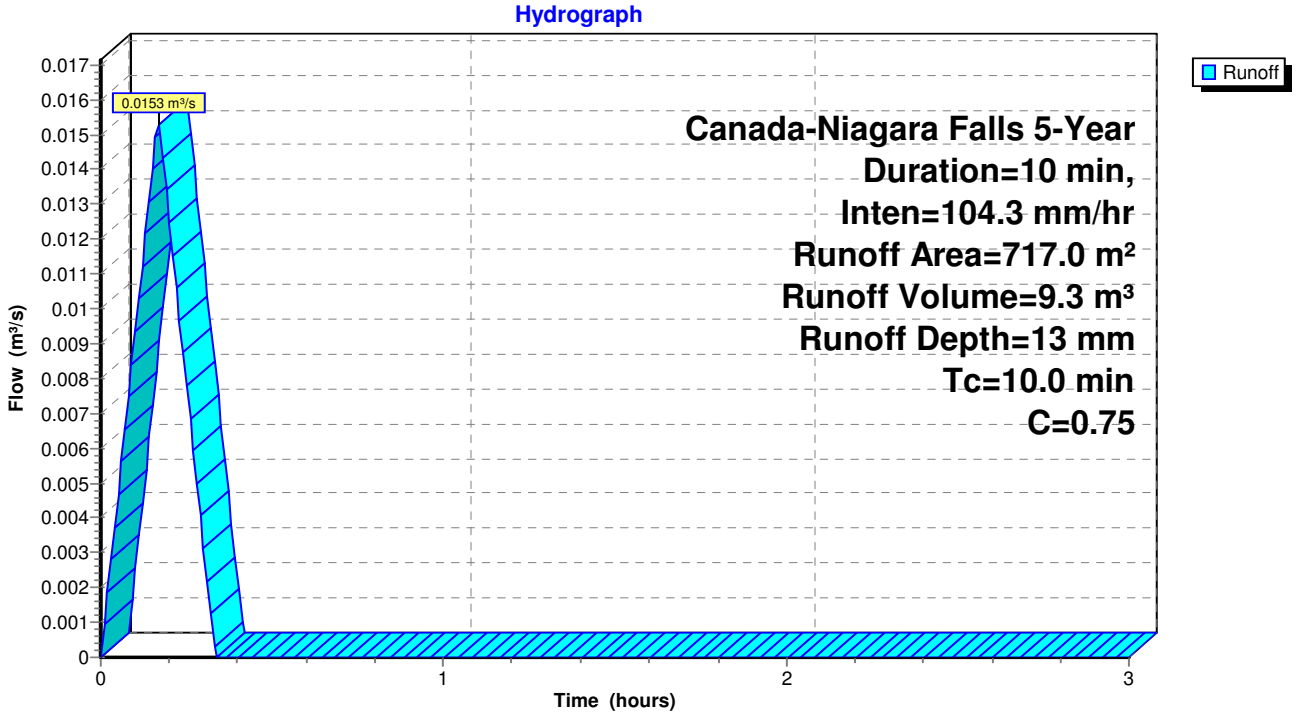
Runoff = 0.0153 m³/s @ 0.17 hrs, Volume= 9.3 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
717.0	0.75	Row Housing
717.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 42S: CA2



Summary for Subcatchment 43S: CA3

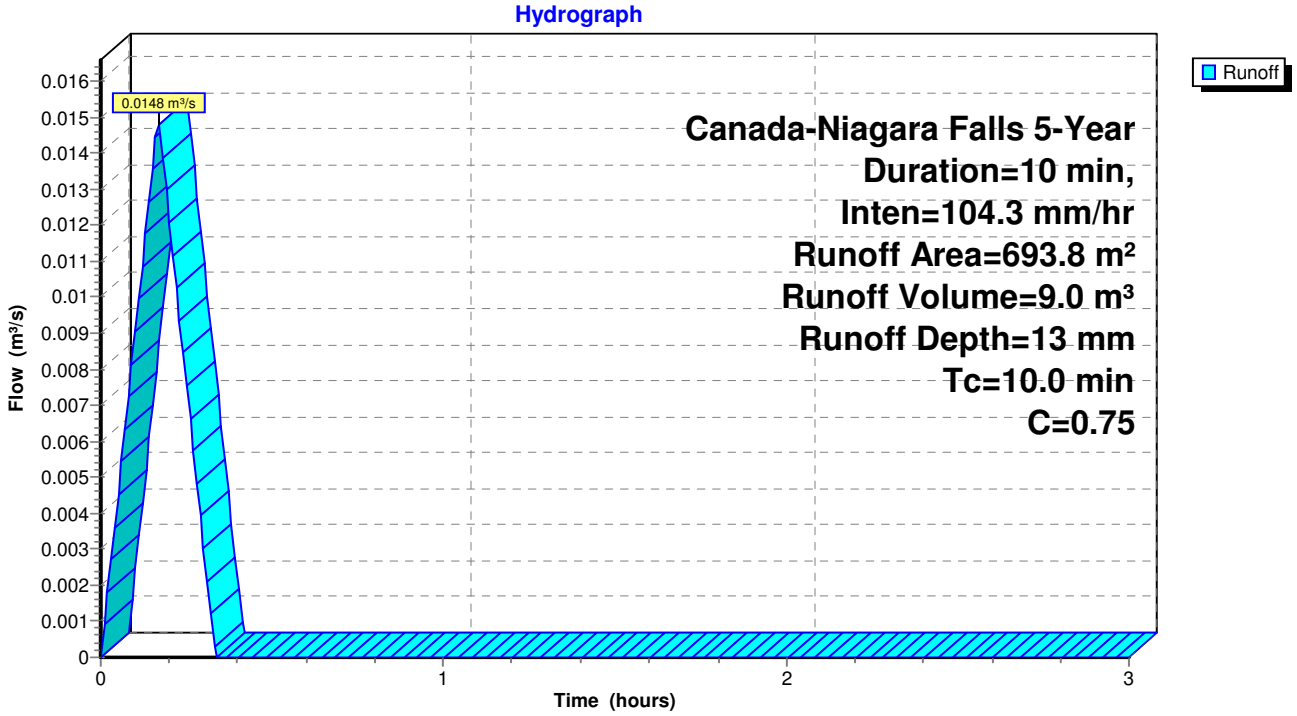
Runoff = 0.0148 m³/s @ 0.17 hrs, Volume= 9.0 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
693.8	0.75	Row Housing
693.8		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 43S: CA3



Summary for Subcatchment 44S: CA4

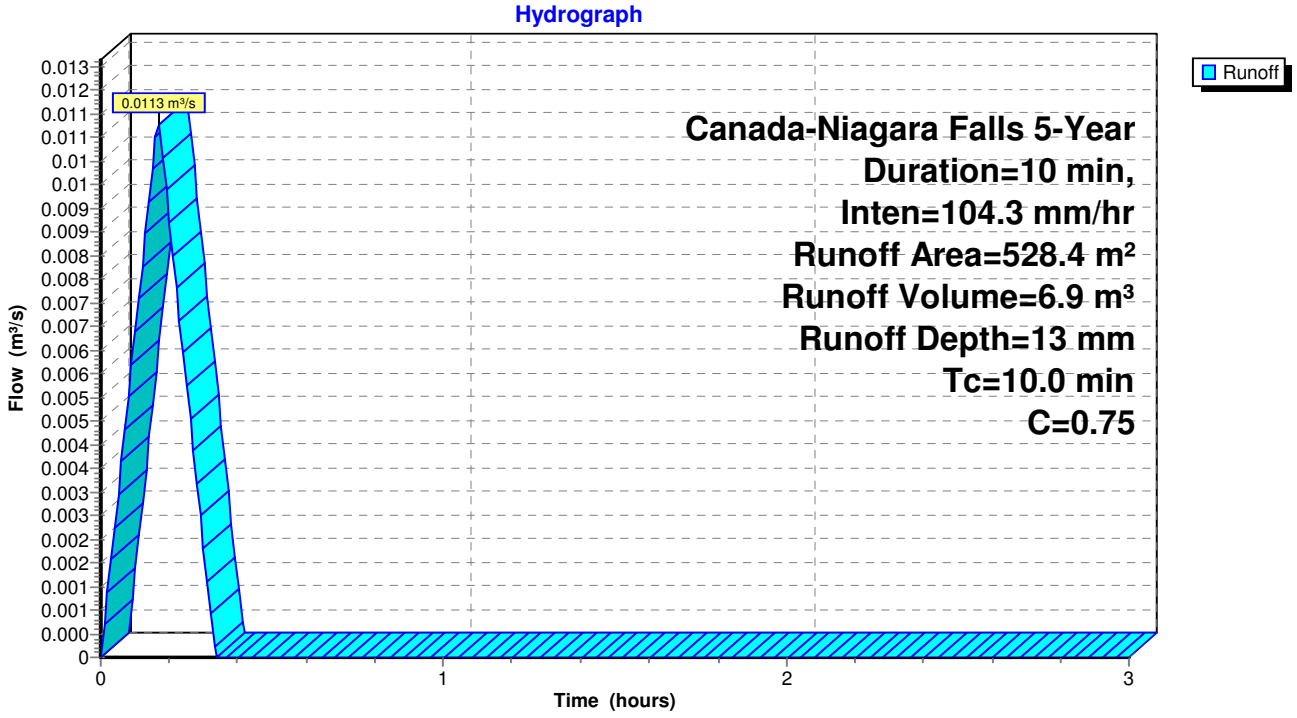
Runoff = 0.0113 m³/s @ 0.17 hrs, Volume= 6.9 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
528.4	0.75	Row Housing
528.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 44S: CA4



Summary for Subcatchment 45S: CA5

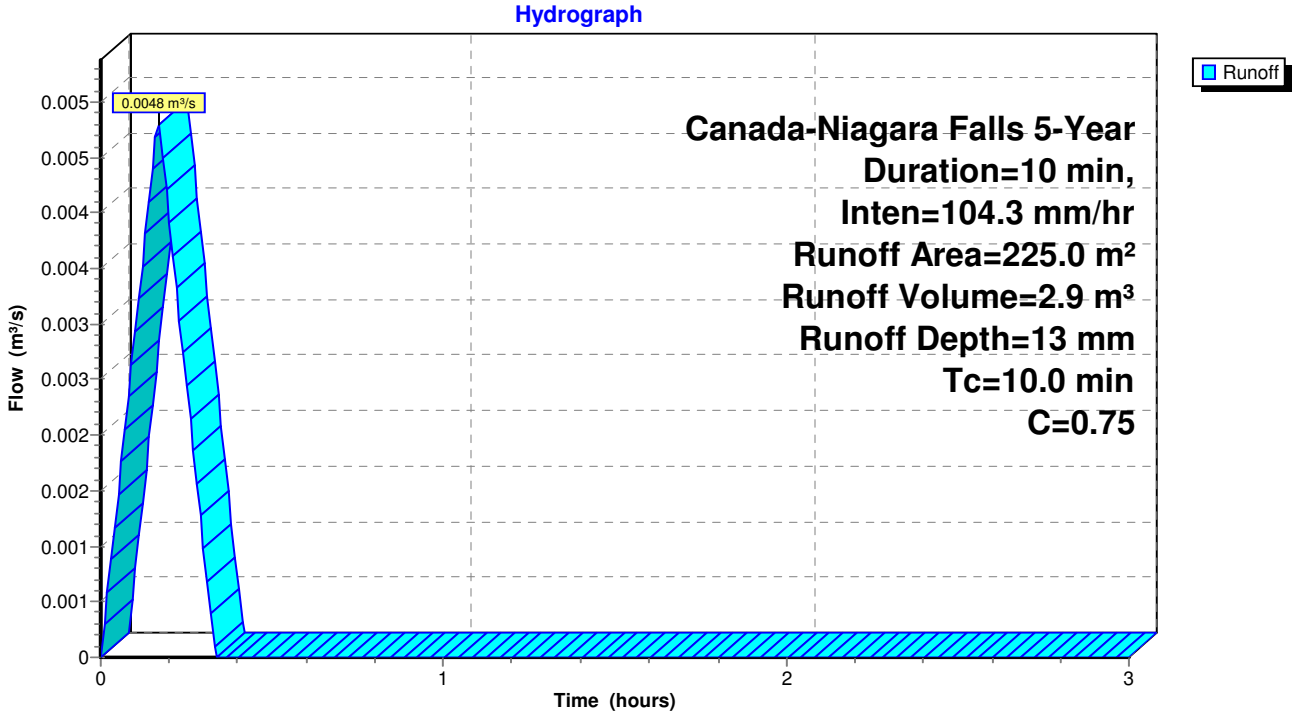
Runoff = 0.0048 m³/s @ 0.17 hrs, Volume= 2.9 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
225.0	0.75	Row Housing
225.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 45S: CA5



Summary for Subcatchment 46S: CA6

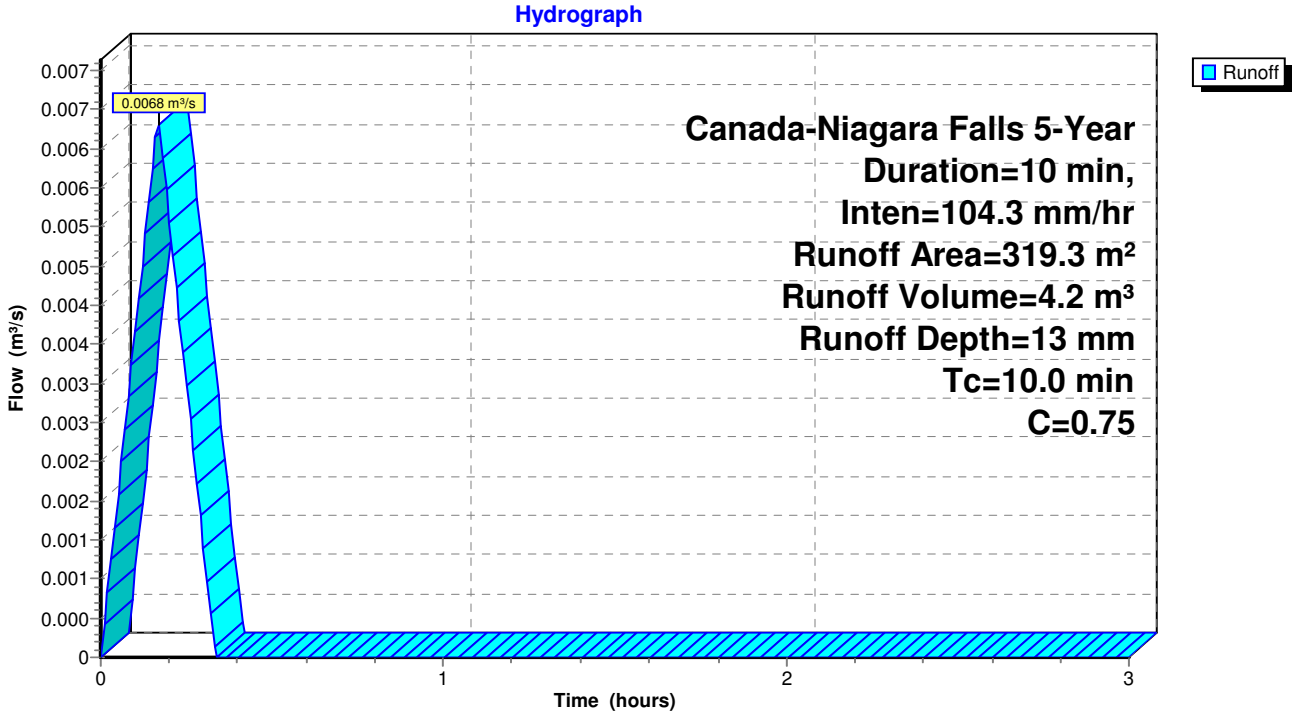
Runoff = 0.0068 m³/s @ 0.17 hrs, Volume= 4.2 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
319.3	0.75	Row Housing
319.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 46S: CA6



Summary for Subcatchment 47S: CA7

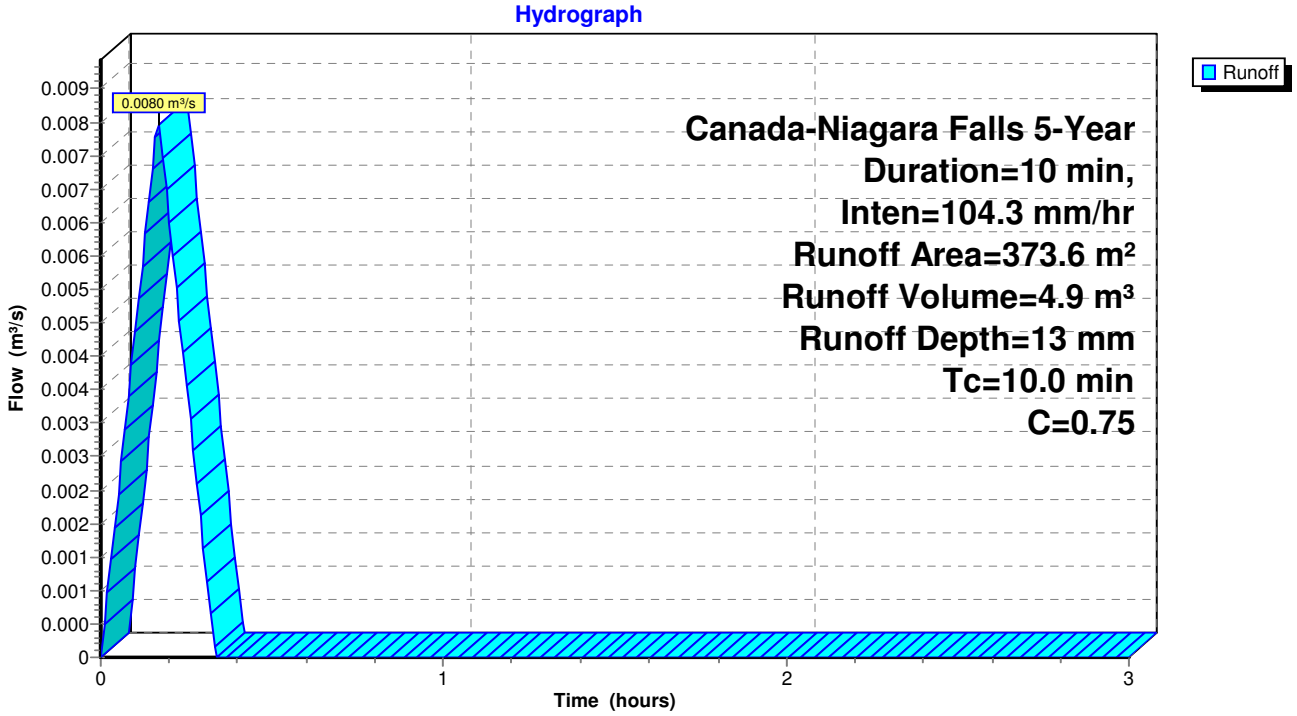
Runoff = 0.0080 m³/s @ 0.17 hrs, Volume= 4.9 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
373.6	0.75	Row Housing
373.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 47S: CA7



Summary for Subcatchment 48S: CA8

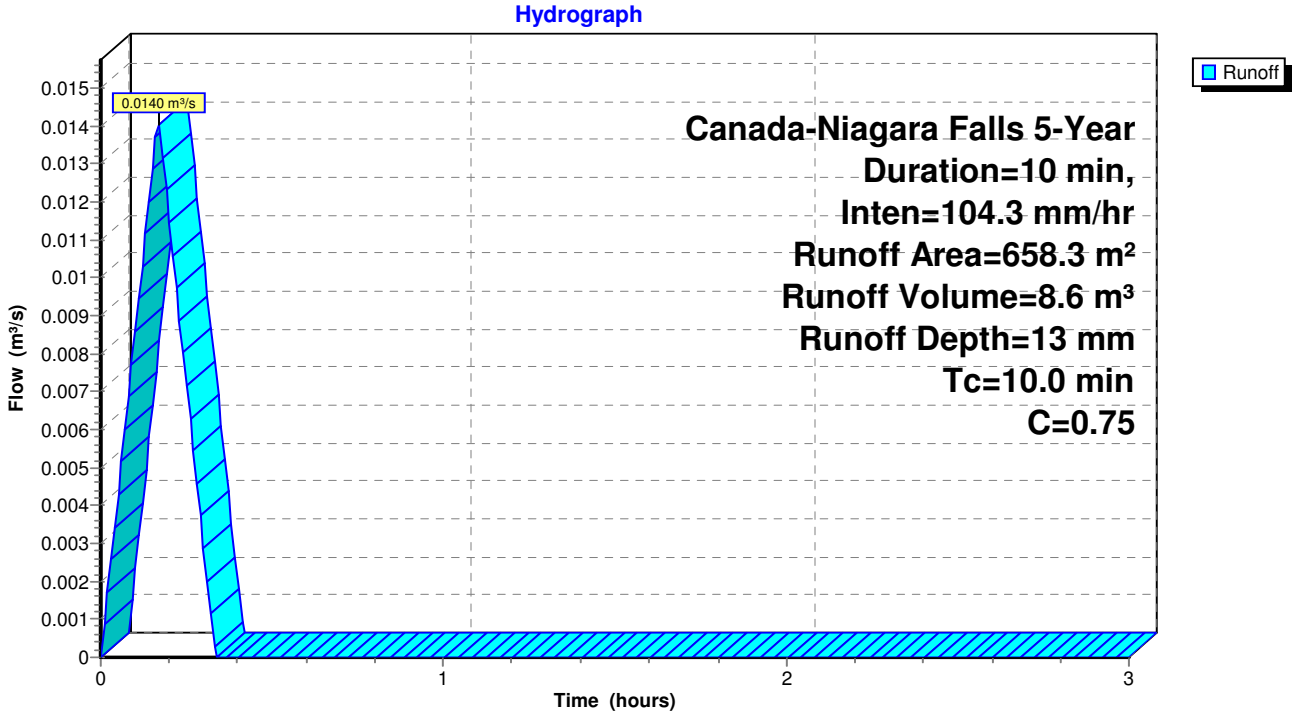
Runoff = 0.0140 m³/s @ 0.17 hrs, Volume= 8.6 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
658.3	0.75	Row Housing
658.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 48S: CA8



Summary for Subcatchment 49S: CA9

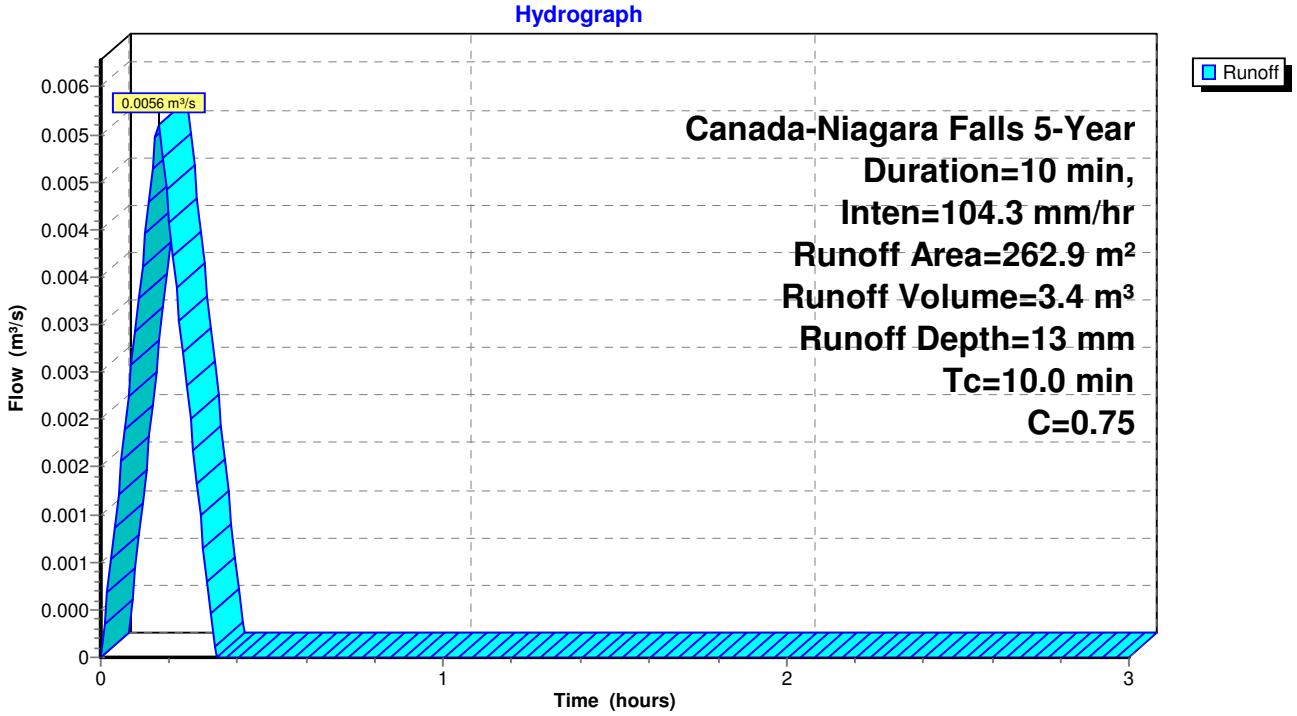
Runoff = 0.0056 m³/s @ 0.17 hrs, Volume= 3.4 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
262.9	0.75	Row Housing
262.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 49S: CA9



Summary for Subcatchment 50S: CA10

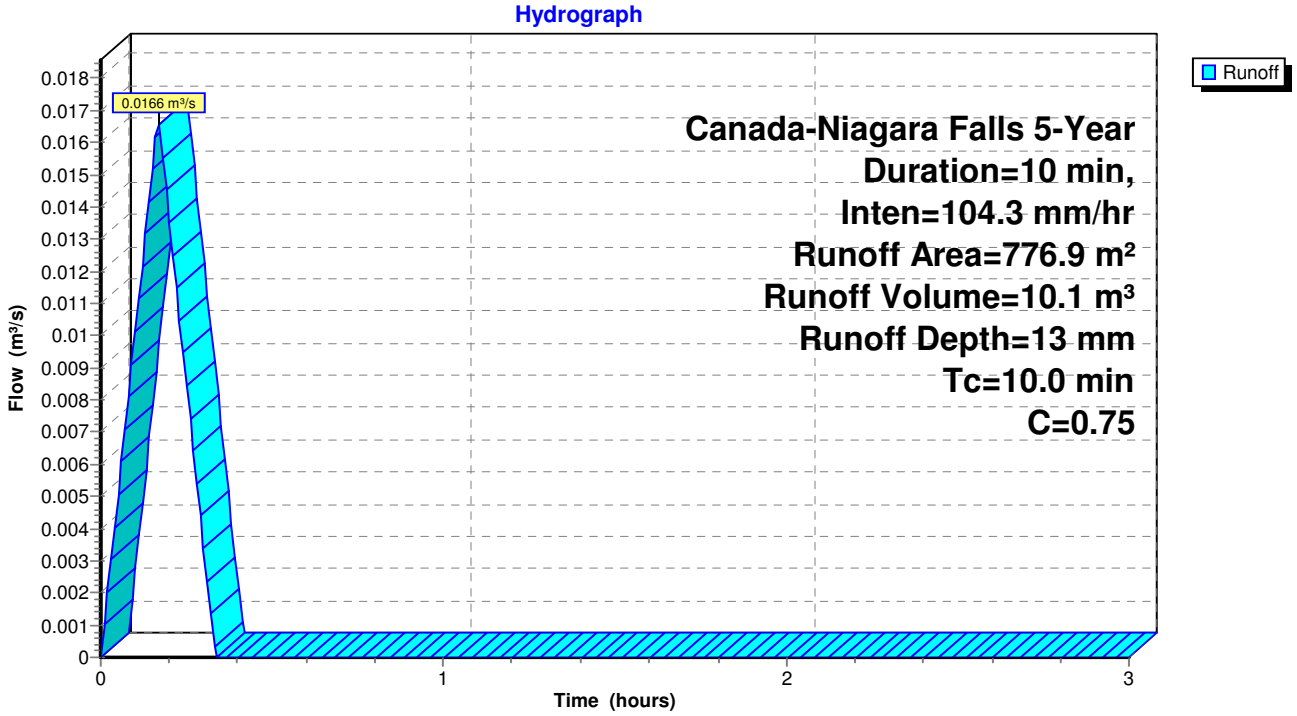
Runoff = 0.0166 m³/s @ 0.17 hrs, Volume= 10.1 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
776.9	0.75	Row Housing
776.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 50S: CA10



Summary for Subcatchment 51S: CA11

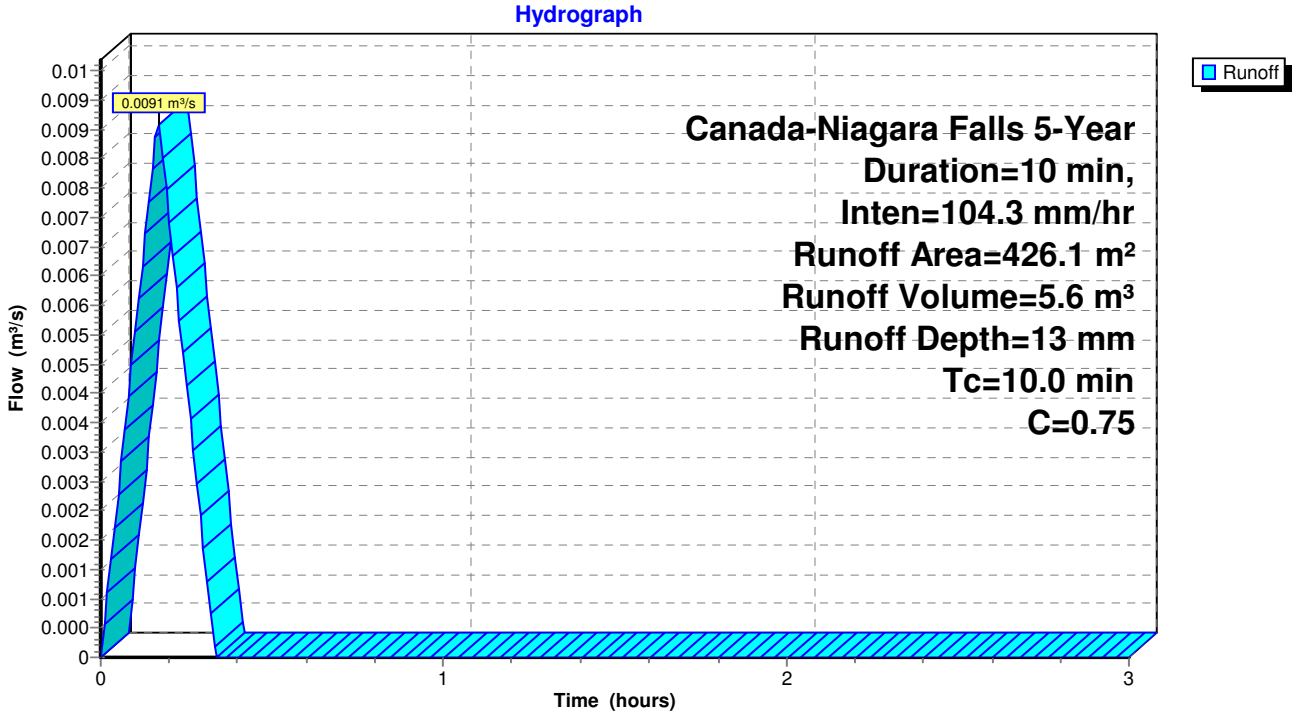
Runoff = 0.0091 m³/s @ 0.17 hrs, Volume= 5.6 m³, Depth= 13 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 5-Year Duration=10 min, Inten=104.3 mm/hr

Area (m²)	C	Description
426.1	0.75	Row Housing
426.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 51S: CA11



Summary for Pond 27P: Outlet

Inflow Area = 5,611.0 m², 0.00% Impervious, Inflow Depth = 13 mm for 5-Year event
Inflow = 0.1198 m³/s @ 0.17 hrs, Volume= 73.1 m³
Outflow = 0.0277 m³/s @ 0.30 hrs, Volume= 73.1 m³, Atten= 77%, Lag= 7.7 min
Primary = 0.0277 m³/s @ 0.30 hrs, Volume= 73.1 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 194.415 m @ 0.30 hrs Surf.Area= 92.0 m² Storage= 53.4 m³
Flood Elev= 194.600 m Surf.Area= 728.8 m² Storage= 117.3 m³

Plug-Flow detention time= 24.1 min calculated for 72.9 m³ (100% of inflow)
Center-of-Mass det. time= 24.3 min (34.3 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	194.400 m	12.3 m³	**Ponding Area 1 (Prismatic)** Listed below (Recalc)
#2	194.500 m	6.2 m³	**Ponding Area 2 (Prismatic)** Listed below (Recalc)
#3	194.500 m	6.2 m³	**Ponding Area 3 (Prismatic)** Listed below (Recalc)
#4	194.450 m	4.1 m³	**Ponding Area 5 (Prismatic)** Listed below (Recalc)
#5	194.400 m	18.4 m³	**Ponding Area 4 (Prismatic)** Listed below (Recalc)
#6	194.200 m	22.5 m³	**Ponding Area 6 (Prismatic)** Listed below (Recalc)
#7	192.680 m	7.1 m³	**600 mm Round Pipe Storage** L= 25.00 m S= 0.0040 m/m
#8	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#9	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#10	192.800 m	7.7 m³	**1.20 mD x 1.70 mH mh** x 4
#11	192.600 m	6.8 m³	**0.60 mD x 2.40 mH Catcbasin** x 10
		118.4 m³	Total Available Storage

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	122.4	12.3	12.3

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

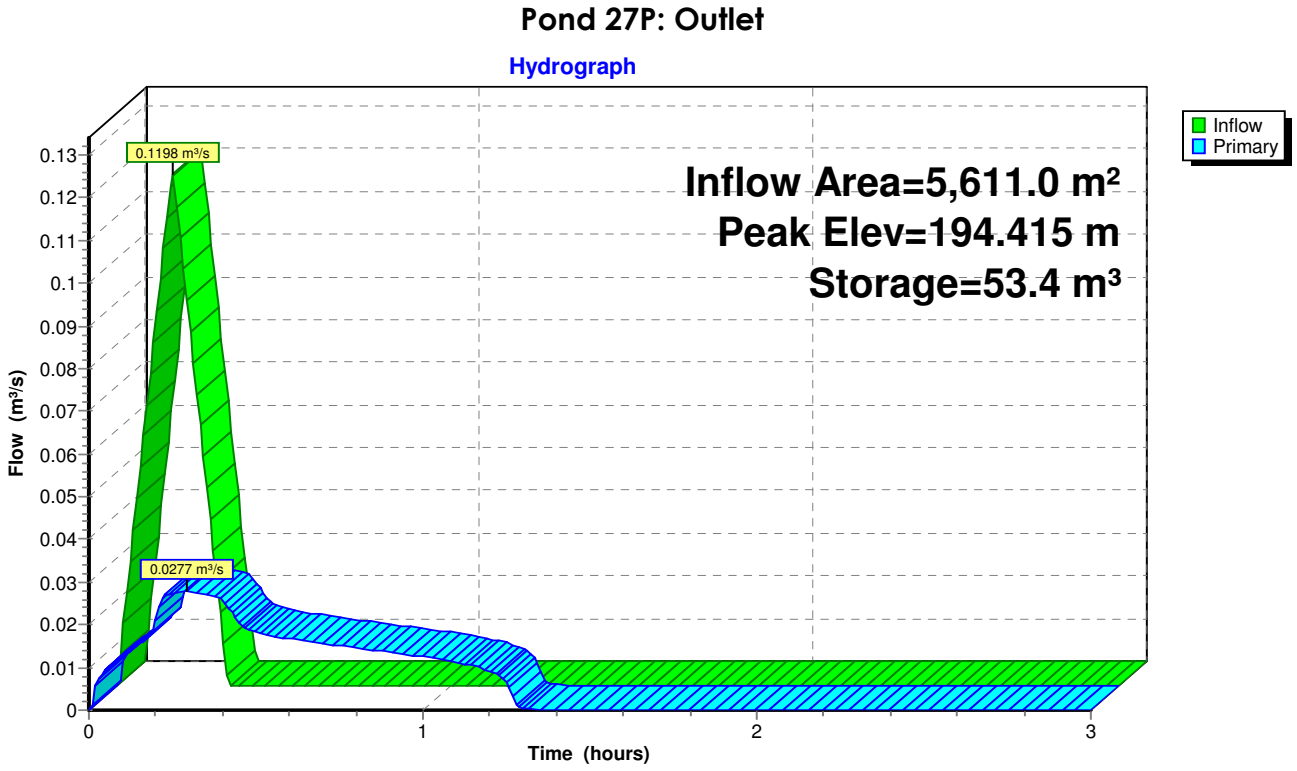
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.450	0.3	0.0	0.0
194.600	55.0	4.1	4.1

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	184.0	18.4	18.4

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.200	0.3	0.0	0.0
194.600	112.0	22.5	22.5

Device	Routing	Invert	Outlet Devices
#1	Primary	192.600 m	**100 mm Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.0277 m³/s @ 0.30 hrs HW=194.415 m (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.0277 m³/s @ 3.53 m/s)



Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 28S: CA1 Runoff Area=629.7 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0156 m³/s 9.5 m³

Subcatchment 29S: Pre Development Area Runoff Area=5,611.0 m² 0.00% Impervious Runoff Depth=12 mm
Tc=10.0 min C=0.60 Runoff=0.1112 m³/s 67.9 m³

Subcatchment 42S: CA2 Runoff Area=717.0 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0178 m³/s 10.8 m³

Subcatchment 43S: CA3 Runoff Area=693.8 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0172 m³/s 10.5 m³

Subcatchment 44S: CA4 Runoff Area=528.4 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0131 m³/s 8.0 m³

Subcatchment 45S: CA5 Runoff Area=225.0 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0056 m³/s 3.4 m³

Subcatchment 46S: CA6 Runoff Area=319.3 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0079 m³/s 4.8 m³

Subcatchment 47S: CA7 Runoff Area=373.6 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0093 m³/s 5.7 m³

Subcatchment 48S: CA8 Runoff Area=658.3 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0163 m³/s 10.0 m³

Subcatchment 49S: CA9 Runoff Area=262.9 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0065 m³/s 4.0 m³

Subcatchment 50S: CA10 Runoff Area=776.9 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0193 m³/s 11.8 m³

Subcatchment 51S: CA11 Runoff Area=426.1 m² 0.00% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.75 Runoff=0.0106 m³/s 6.4 m³

Pond 27P: Outlet Peak Elev=194.481 m Storage=63.6 m³ Inflow=0.1390 m³/s 84.9 m³
Outflow=0.0282 m³/s 84.9 m³

Total Runoff Area = 11,222.0 m² Runoff Volume = 152.8 m³ Average Runoff Depth = 14 mm
100.00% Pervious = 11,222.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 28S: CA1

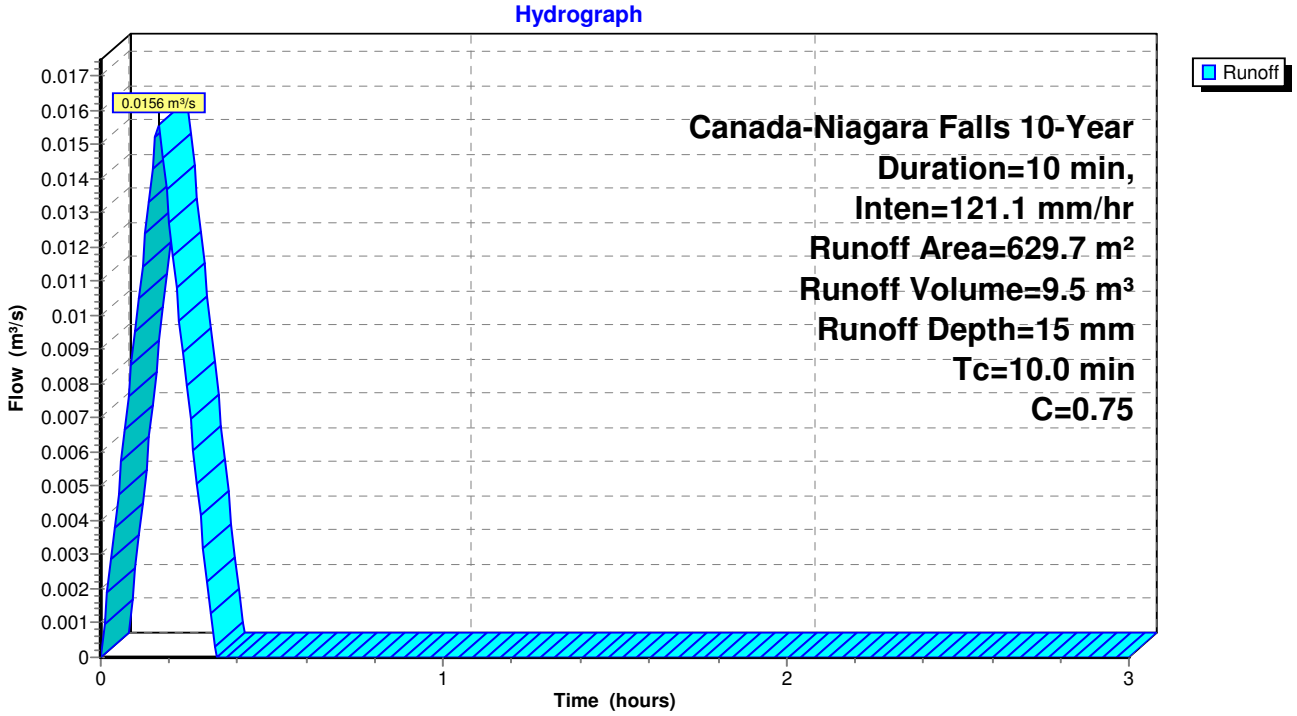
Runoff = 0.0156 m³/s @ 0.17 hrs, Volume= 9.5 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
629.7	0.75	Row Housing
629.7		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 28S: CA1



Summary for Subcatchment 29S: Pre Development Area 1

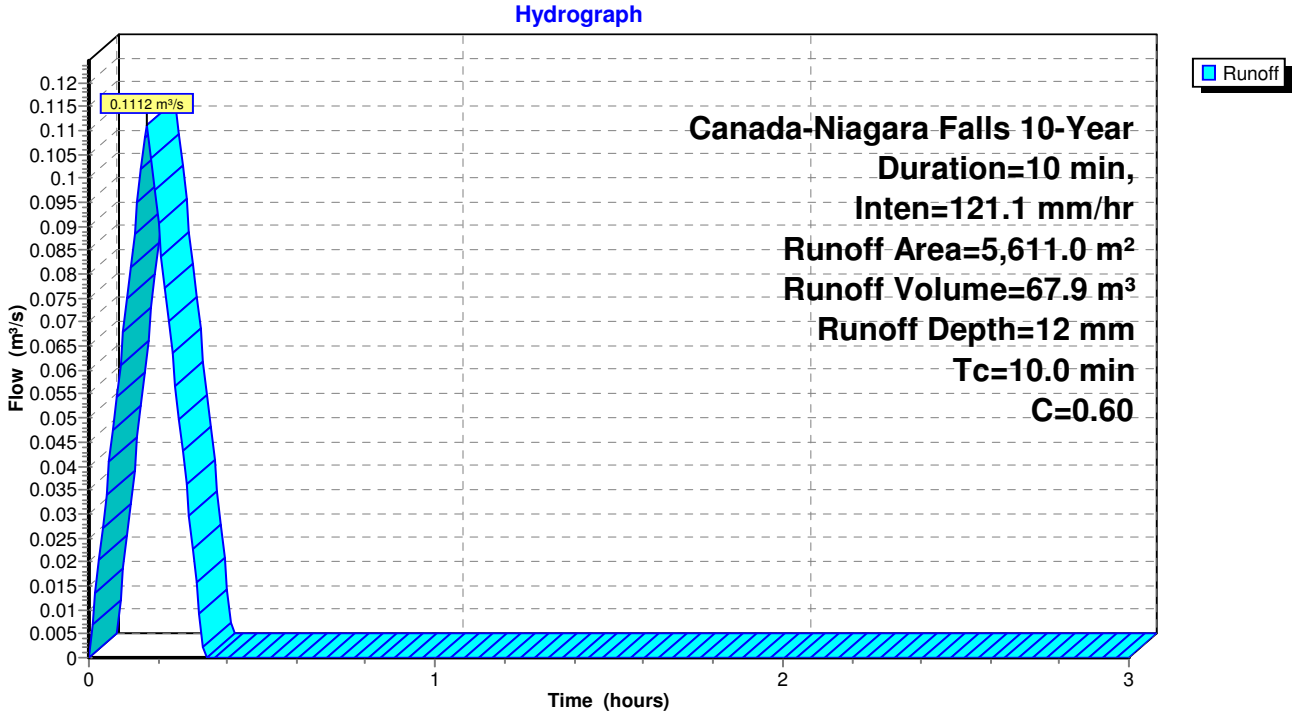
Runoff = 0.1112 m³/s @ 0.17 hrs, Volume= 67.9 m³, Depth= 12 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
5,611.0	0.60	Existing Single Family
5,611.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 29S: Pre Development Area 1



Summary for Subcatchment 42S: CA2

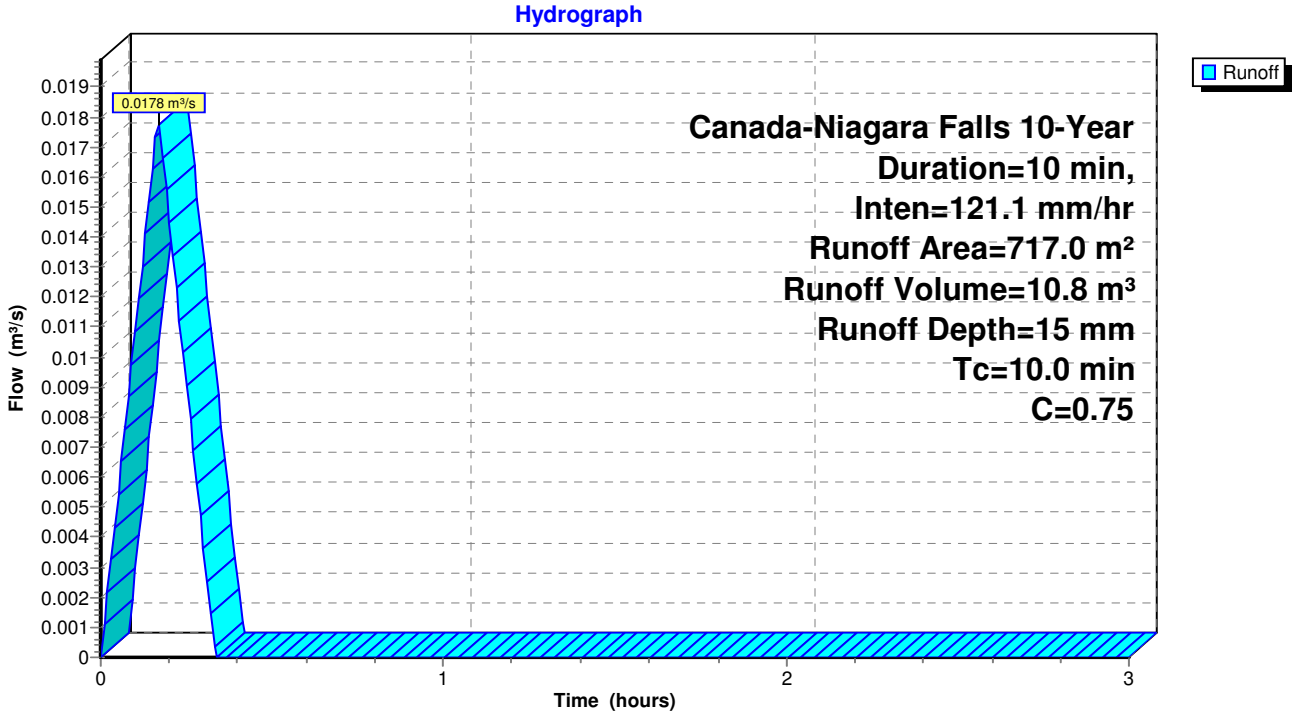
Runoff = 0.0178 m³/s @ 0.17 hrs, Volume= 10.8 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
717.0	0.75	Row Housing
717.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 42S: CA2



Summary for Subcatchment 43S: CA3

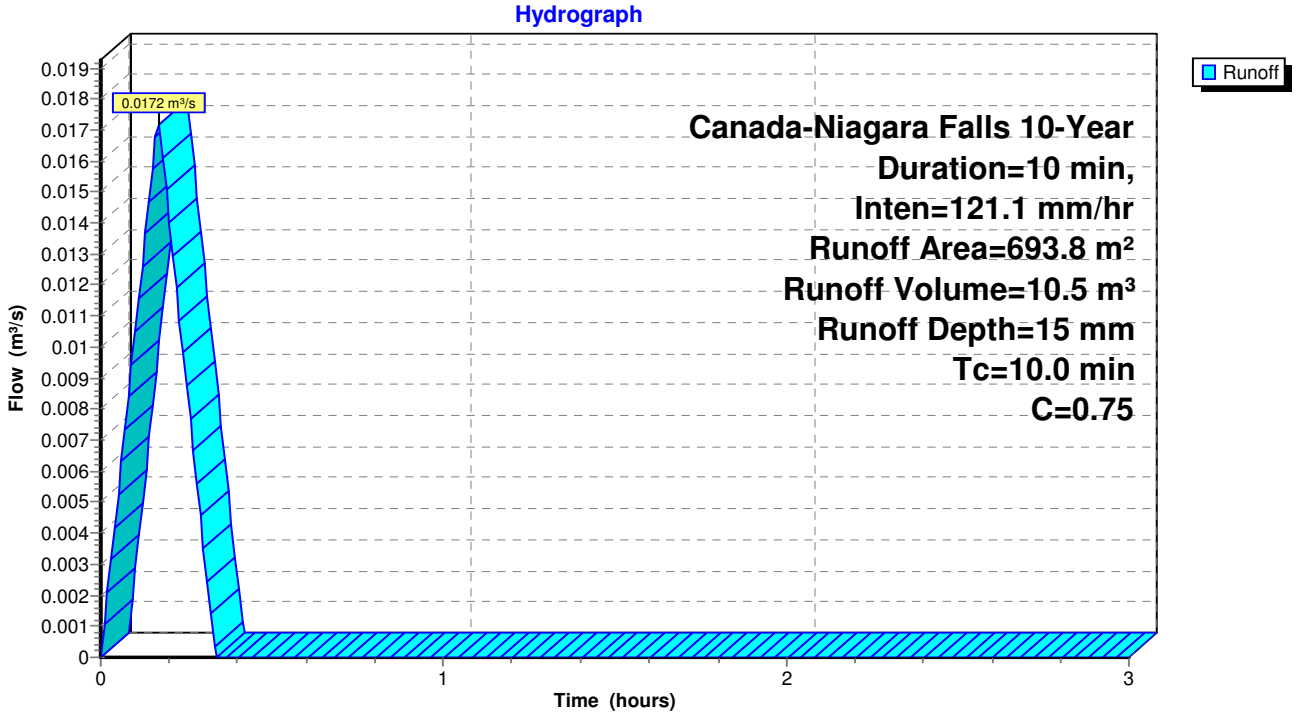
Runoff = 0.0172 m³/s @ 0.17 hrs, Volume= 10.5 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
693.8	0.75	Row Housing
693.8		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 43S: CA3



Summary for Subcatchment 44S: CA4

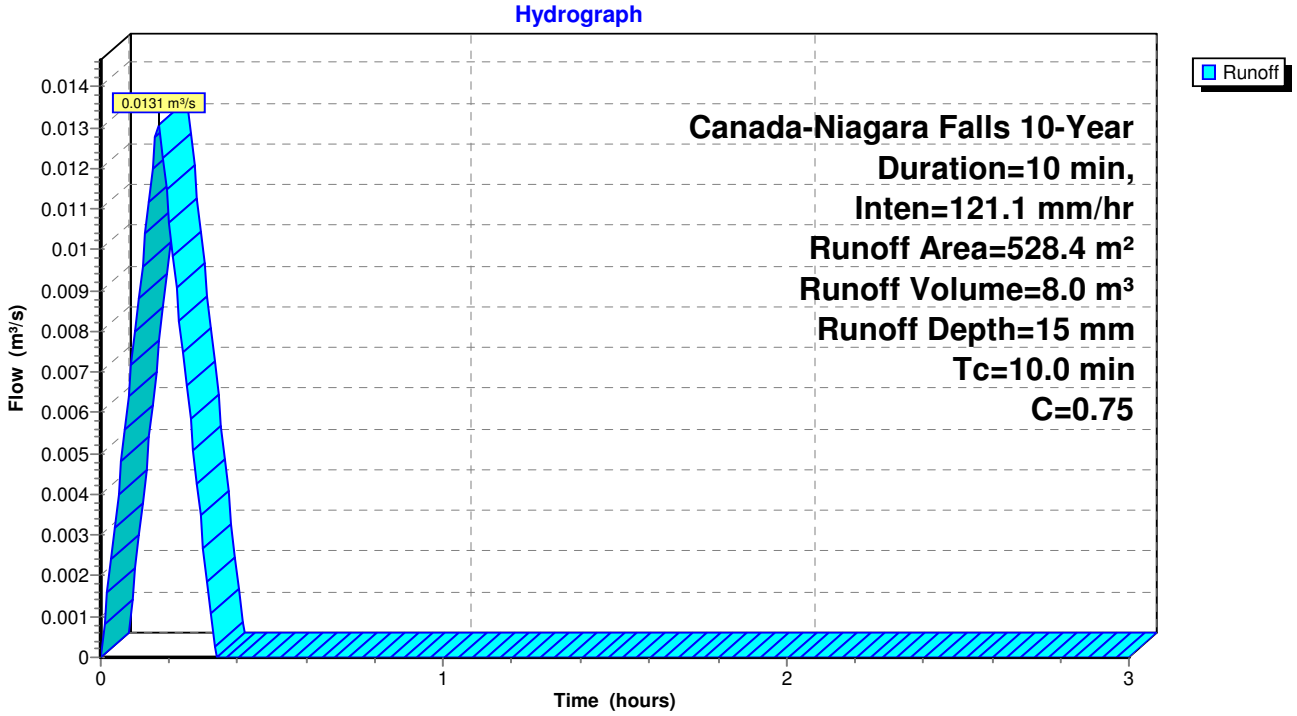
Runoff = 0.0131 m³/s @ 0.17 hrs, Volume= 8.0 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
528.4	0.75	Row Housing
528.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 44S: CA4



Summary for Subcatchment 45S: CA5

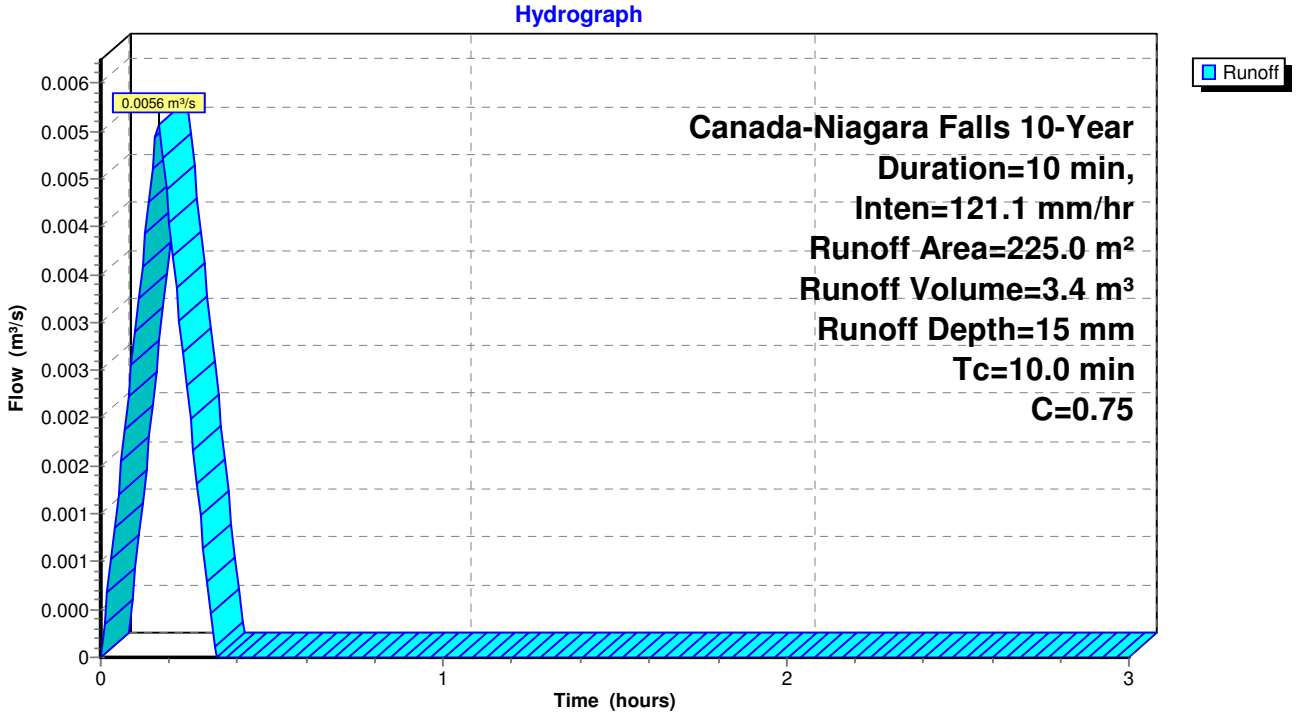
Runoff = 0.0056 m³/s @ 0.17 hrs, Volume= 3.4 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
225.0	0.75	Row Housing
225.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 45S: CA5



Summary for Subcatchment 46S: CA6

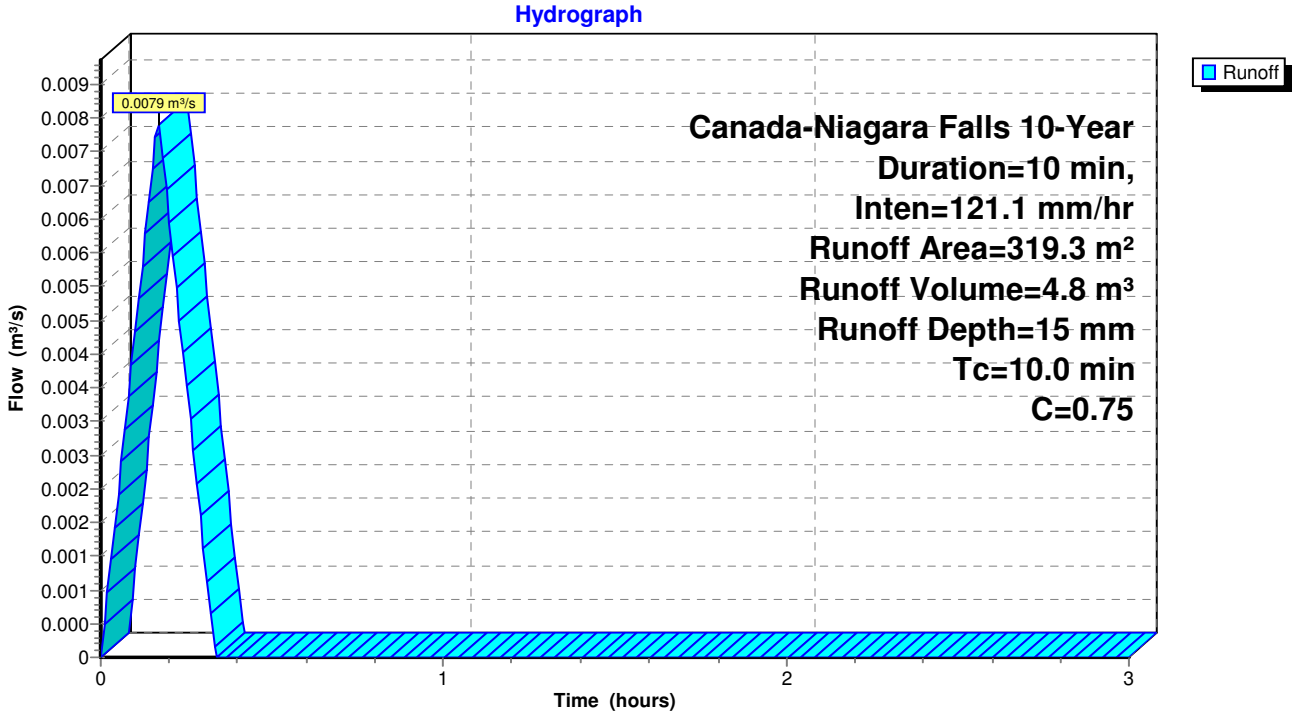
Runoff = 0.0079 m³/s @ 0.17 hrs, Volume= 4.8 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
319.3	0.75	Row Housing
319.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 46S: CA6



Summary for Subcatchment 47S: CA7

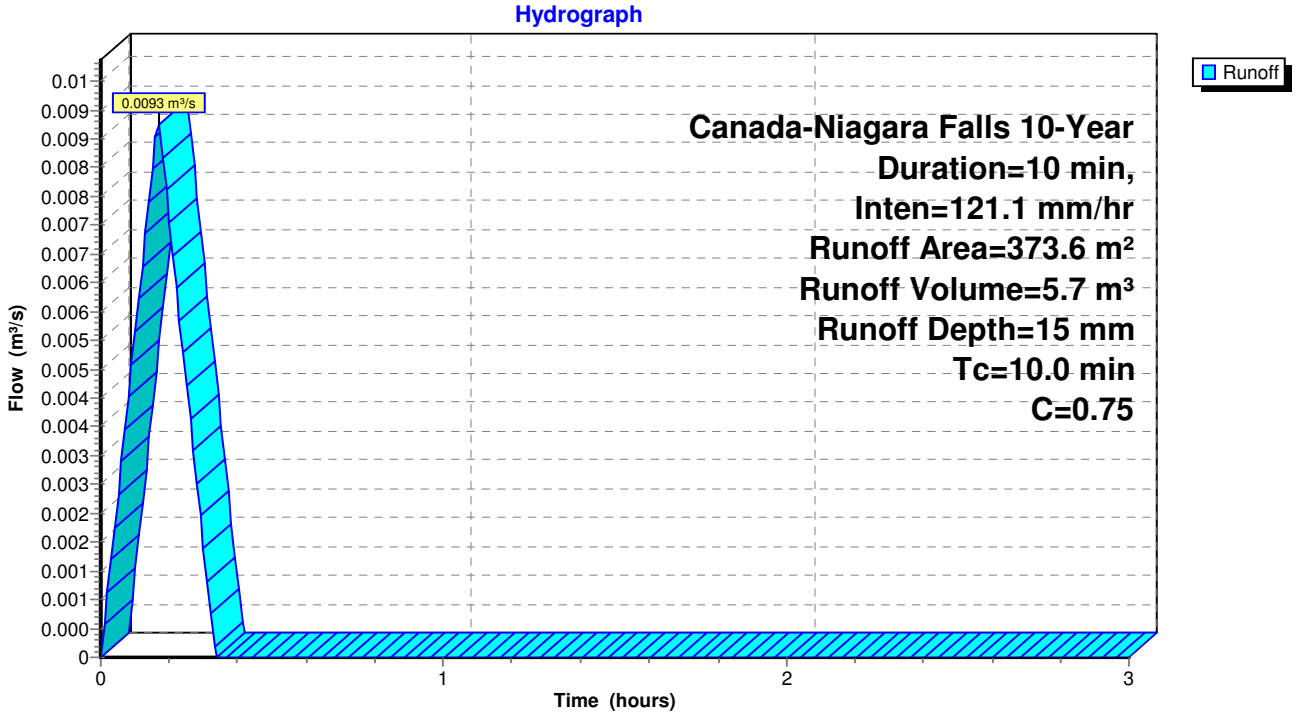
Runoff = 0.0093 m³/s @ 0.17 hrs, Volume= 5.7 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
373.6	0.75	Row Housing
373.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 47S: CA7



Summary for Subcatchment 48S: CA8

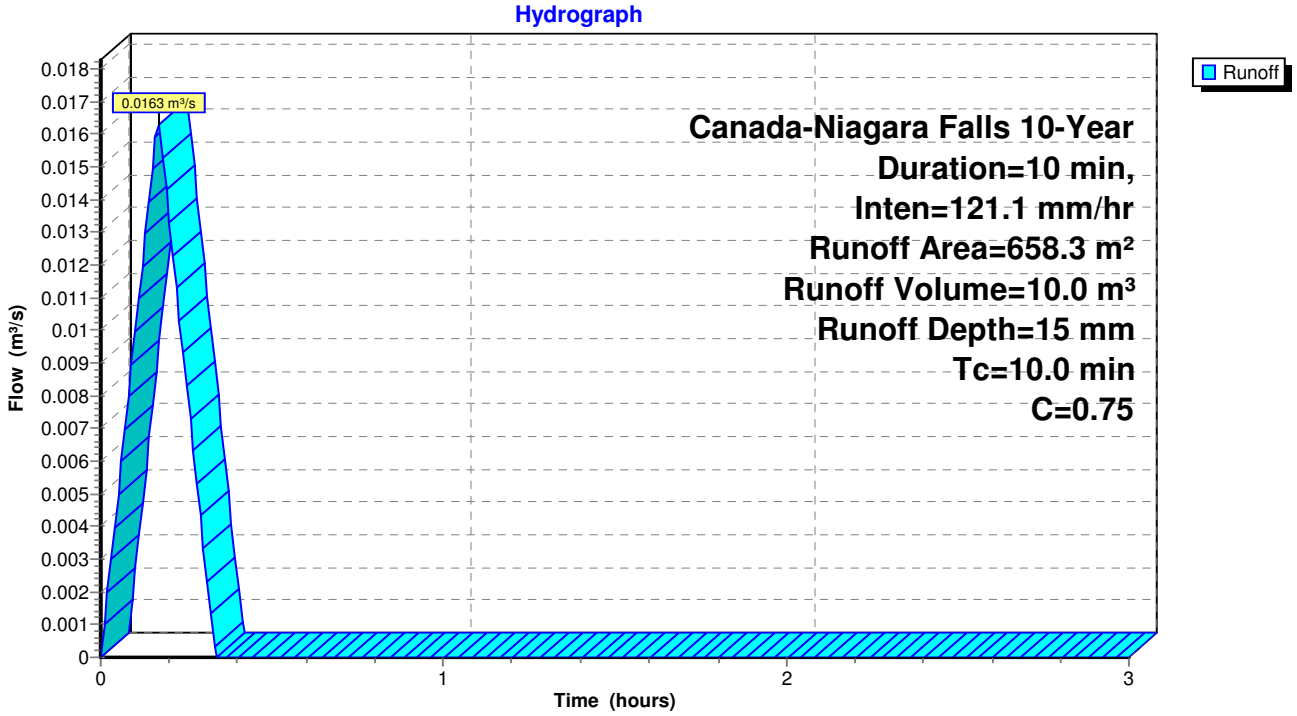
Runoff = 0.0163 m³/s @ 0.17 hrs, Volume= 10.0 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
658.3	0.75	Row Housing
658.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 48S: CA8



Summary for Subcatchment 49S: CA9

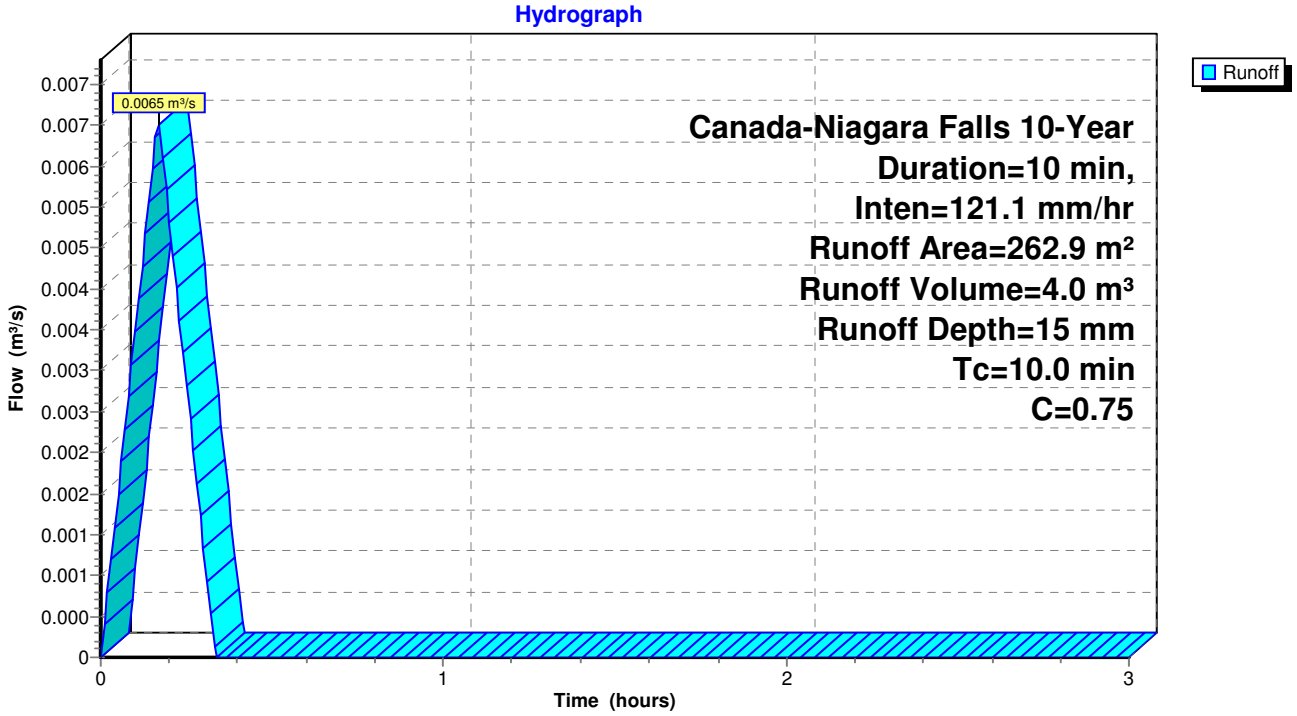
Runoff = 0.0065 m³/s @ 0.17 hrs, Volume= 4.0 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
262.9	0.75	Row Housing
262.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 49S: CA9



Summary for Subcatchment 50S: CA10

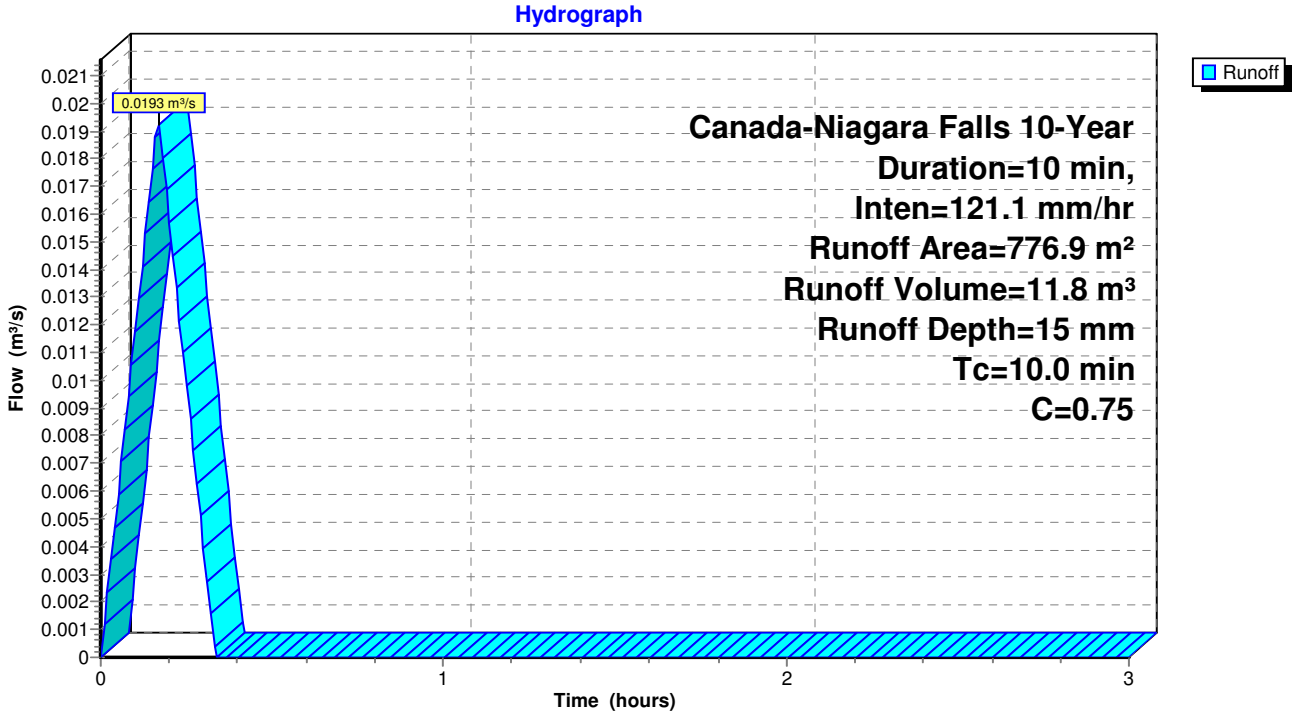
Runoff = 0.0193 m³/s @ 0.17 hrs, Volume= 11.8 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
776.9	0.75	Row Housing
776.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 50S: CA10



Summary for Subcatchment 51S: CA11

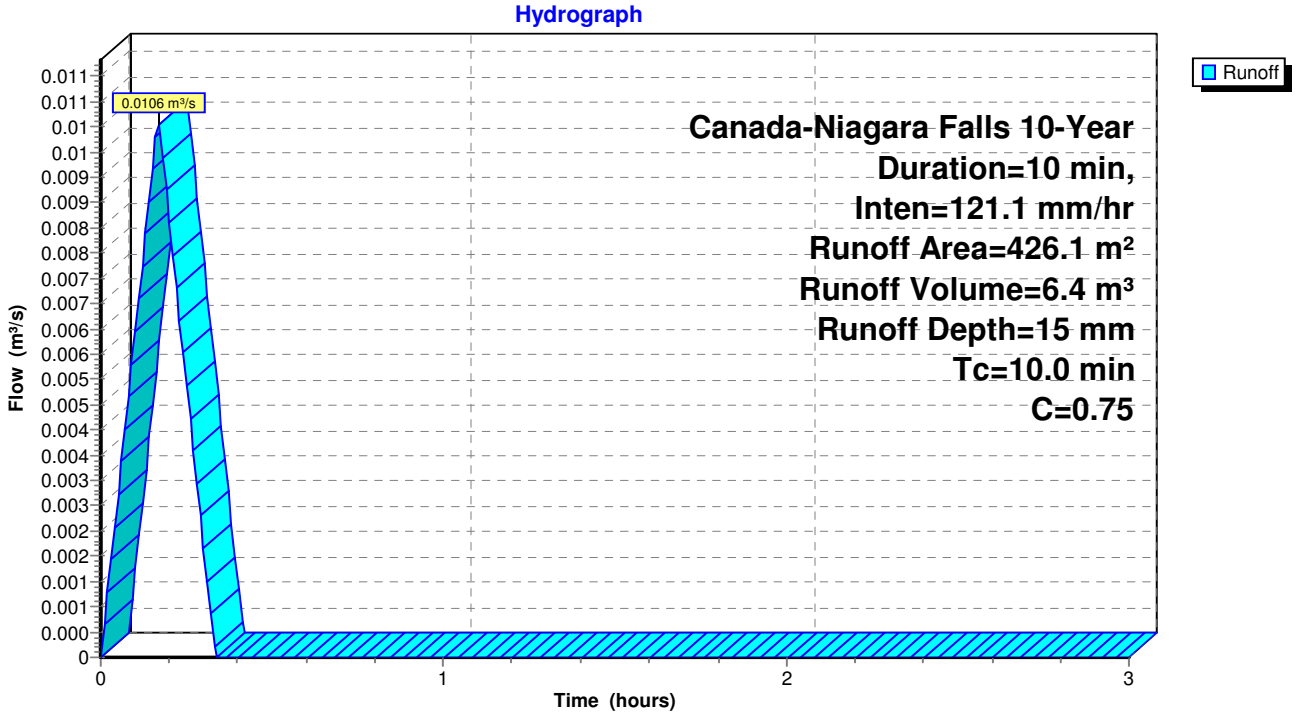
Runoff = 0.0106 m³/s @ 0.17 hrs, Volume= 6.4 m³, Depth= 15 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 10-Year Duration=10 min, Inten=121.1 mm/hr

Area (m²)	C	Description
426.1	0.75	Row Housing
426.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 51S: CA11



Summary for Pond 27P: Outlet

Inflow Area = 5,611.0 m², 0.00% Impervious, Inflow Depth = 15 mm for 10-Year event
Inflow = 0.1390 m³/s @ 0.17 hrs, Volume= 84.9 m³
Outflow = 0.0282 m³/s @ 0.30 hrs, Volume= 84.9 m³, Atten= 80%, Lag= 8.0 min
Primary = 0.0282 m³/s @ 0.30 hrs, Volume= 84.9 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 194.481 m @ 0.30 hrs Surf.Area= 223.1 m² Storage= 63.6 m³
Flood Elev= 194.600 m Surf.Area= 728.8 m² Storage= 117.3 m³

Plug-Flow detention time= 26.2 min calculated for 84.6 m³ (100% of inflow)
Center-of-Mass det. time= 26.3 min (36.3 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	194.400 m	12.3 m³	**Ponding Area 1 (Prismatic)** Listed below (Recalc)
#2	194.500 m	6.2 m³	**Ponding Area 2 (Prismatic)** Listed below (Recalc)
#3	194.500 m	6.2 m³	**Ponding Area 3 (Prismatic)** Listed below (Recalc)
#4	194.450 m	4.1 m³	**Ponding Area 5 (Prismatic)** Listed below (Recalc)
#5	194.400 m	18.4 m³	**Ponding Area 4 (Prismatic)** Listed below (Recalc)
#6	194.200 m	22.5 m³	**Ponding Area 6 (Prismatic)** Listed below (Recalc)
#7	192.680 m	7.1 m³	**600 mm Round Pipe Storage** L= 25.00 m S= 0.0040 m/m
#8	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#9	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#10	192.800 m	7.7 m³	**1.20 mD x 1.70 mH mh** x 4
#11	192.600 m	6.8 m³	**0.60 mD x 2.40 mH Catcbasin** x 10
		118.4 m³	Total Available Storage

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	122.4	12.3	12.3

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

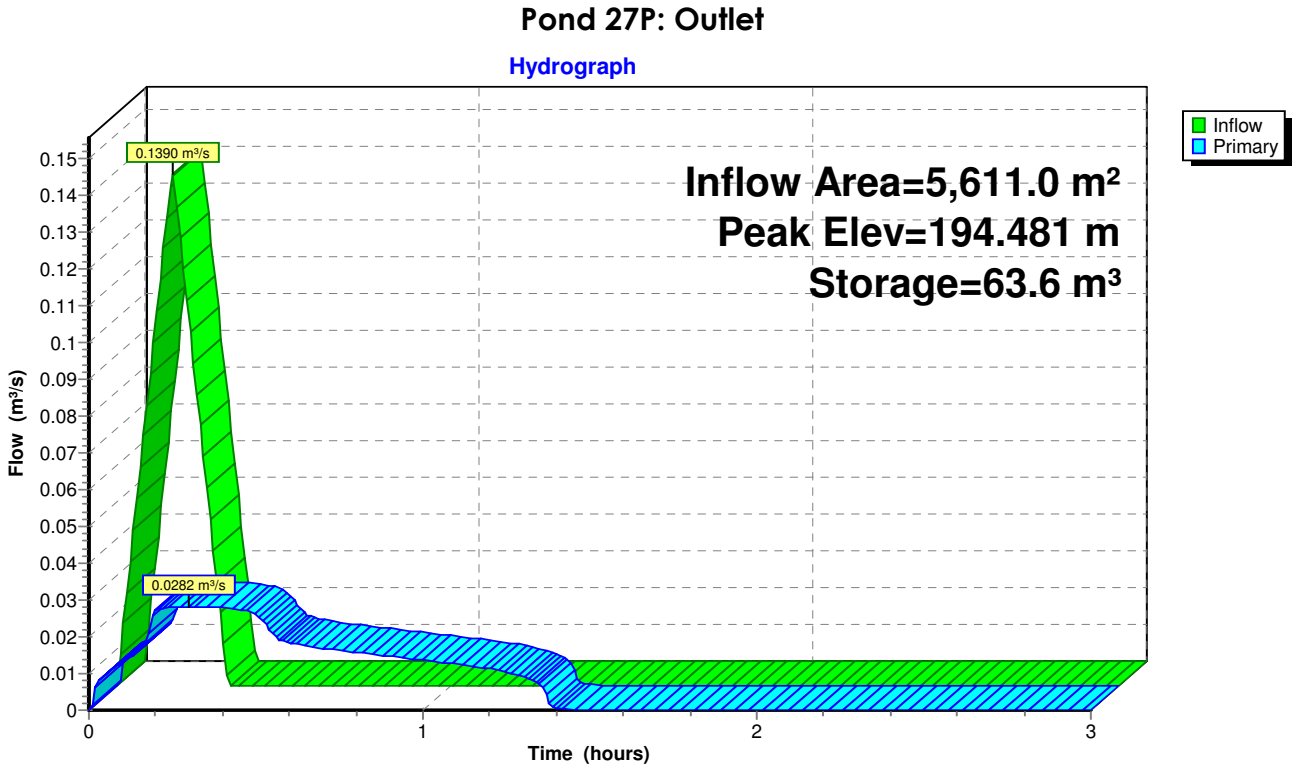
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.450	0.3	0.0	0.0
194.600	55.0	4.1	4.1

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	184.0	18.4	18.4

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.200	0.3	0.0	0.0
194.600	112.0	22.5	22.5

Device	Routing	Invert	Outlet Devices
#1	Primary	192.600 m	**100 mm Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.0282 m³/s @ 0.30 hrs HW=194.481 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0282 m³/s @ 3.60 m/s)



Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 28S: CA1 Runoff Area=629.7 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0183 m³/s 11.2 m³

Subcatchment 29S: Pre Development Area Runoff Area=5,611.0 m² 0.00% Impervious Runoff Depth=14 mm
Tc=10.0 min C=0.60 Runoff=0.1305 m³/s 79.7 m³

Subcatchment 42S: CA2 Runoff Area=717.0 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0208 m³/s 12.7 m³

Subcatchment 43S: CA3 Runoff Area=693.8 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0202 m³/s 12.3 m³

Subcatchment 44S: CA4 Runoff Area=528.4 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0154 m³/s 9.4 m³

Subcatchment 45S: CA5 Runoff Area=225.0 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0065 m³/s 4.0 m³

Subcatchment 46S: CA6 Runoff Area=319.3 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0093 m³/s 5.7 m³

Subcatchment 47S: CA7 Runoff Area=373.6 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0109 m³/s 6.6 m³

Subcatchment 48S: CA8 Runoff Area=658.3 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0191 m³/s 11.7 m³

Subcatchment 49S: CA9 Runoff Area=262.9 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0076 m³/s 4.7 m³

Subcatchment 50S: CA10 Runoff Area=776.9 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0226 m³/s 13.8 m³

Subcatchment 51S: CA11 Runoff Area=426.1 m² 0.00% Impervious Runoff Depth=18 mm
Tc=10.0 min C=0.75 Runoff=0.0124 m³/s 7.6 m³

Pond 27P: Outlet Peak Elev=194.527 m Storage=77.0 m³ Inflow=0.1631 m³/s 99.6 m³
Outflow=0.0286 m³/s 99.6 m³

Total Runoff Area = 11,222.0 m² Runoff Volume = 179.3 m³ Average Runoff Depth = 16 mm
100.00% Pervious = 11,222.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 28S: CA1

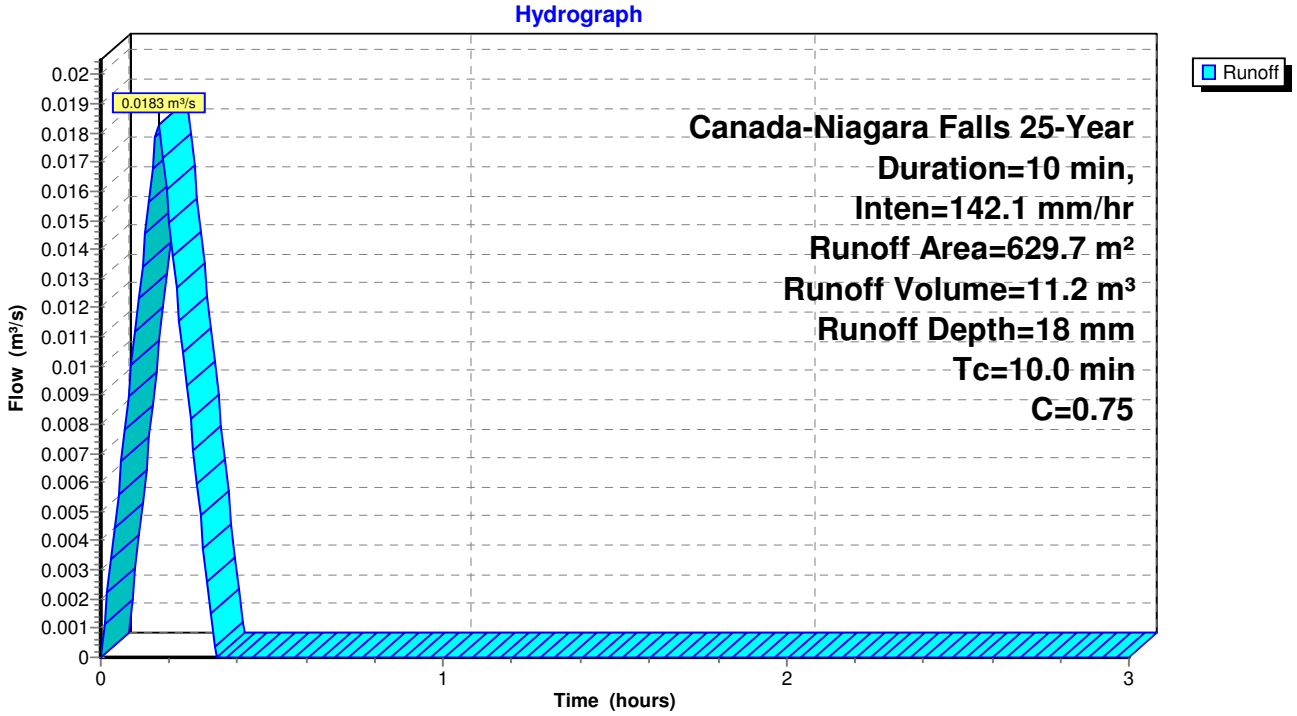
Runoff = 0.0183 m³/s @ 0.17 hrs, Volume= 11.2 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
629.7	0.75	Row Housing
629.7		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 28S: CA1



Summary for Subcatchment 29S: Pre Development Area 1

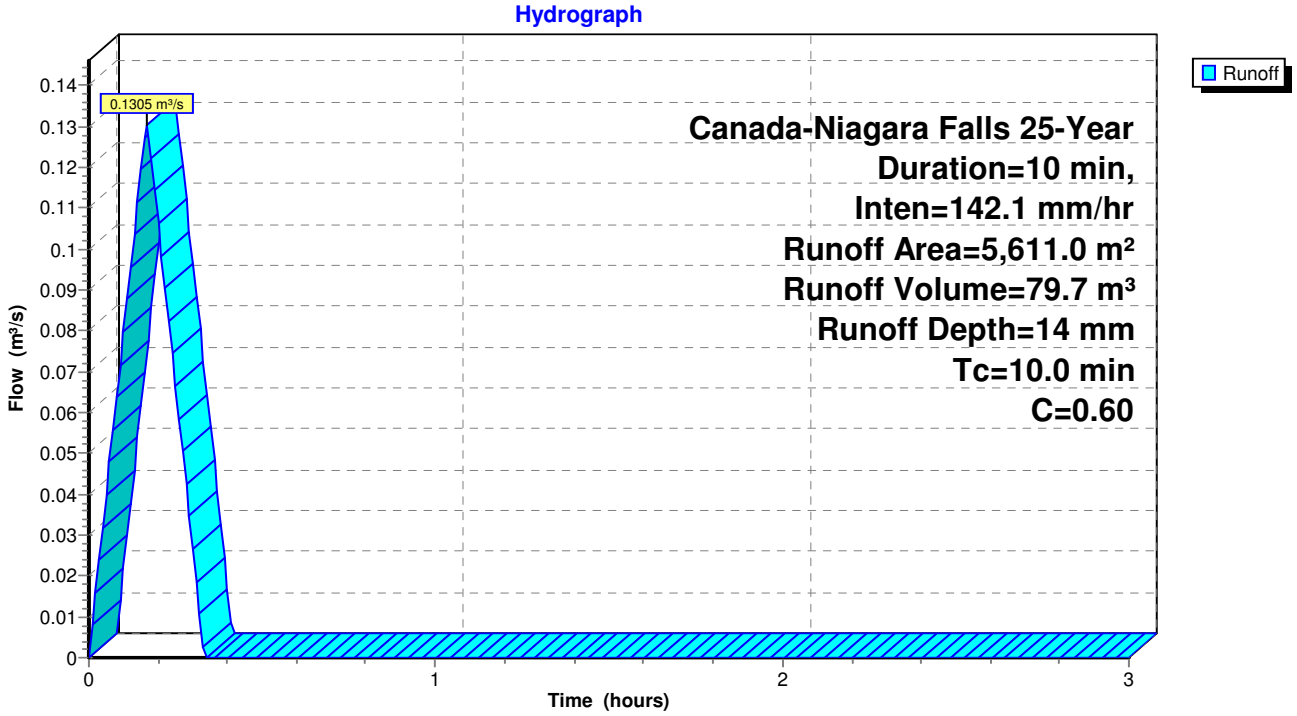
Runoff = 0.1305 m³/s @ 0.17 hrs, Volume= 79.7 m³, Depth= 14 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
5,611.0	0.60	Existing Single Family
5,611.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 29S: Pre Development Area 1



Summary for Subcatchment 42S: CA2

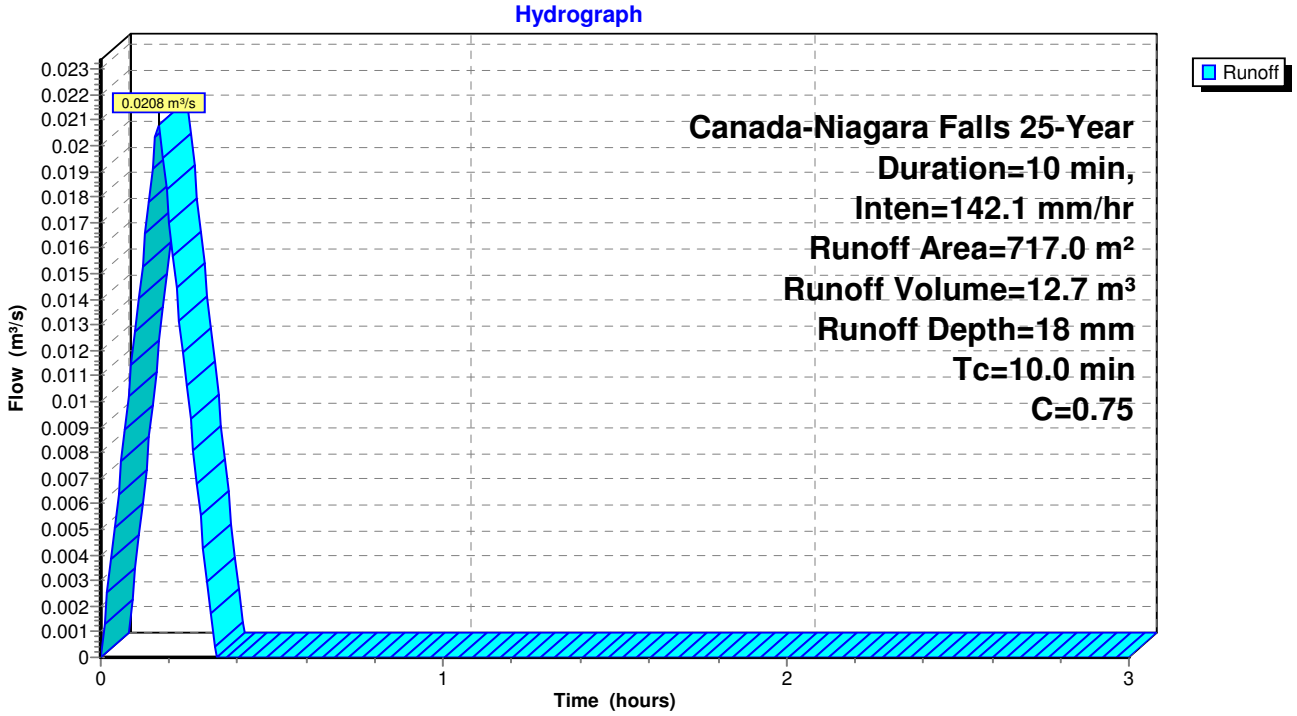
Runoff = 0.0208 m³/s @ 0.17 hrs, Volume= 12.7 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
717.0	0.75	Row Housing
717.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 42S: CA2



Summary for Subcatchment 43S: CA3

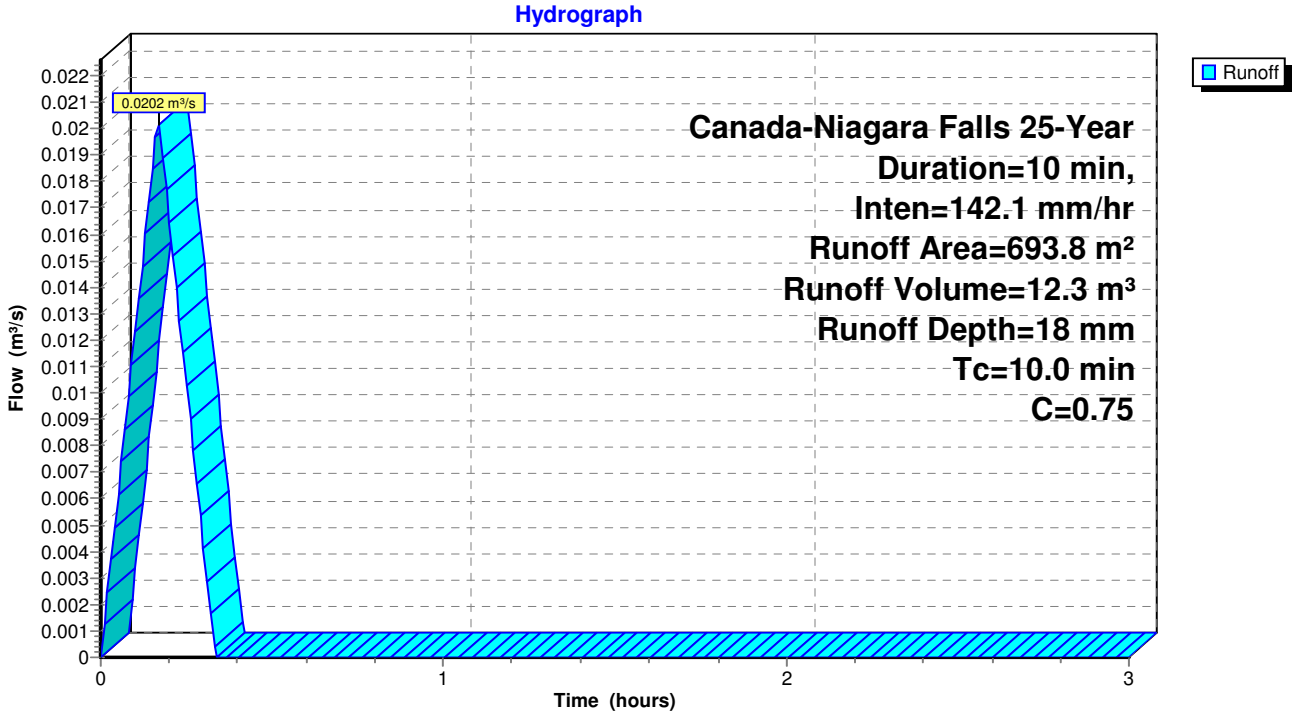
Runoff = 0.0202 m³/s @ 0.17 hrs, Volume= 12.3 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
693.8	0.75	Row Housing
693.8		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 43S: CA3



Summary for Subcatchment 44S: CA4

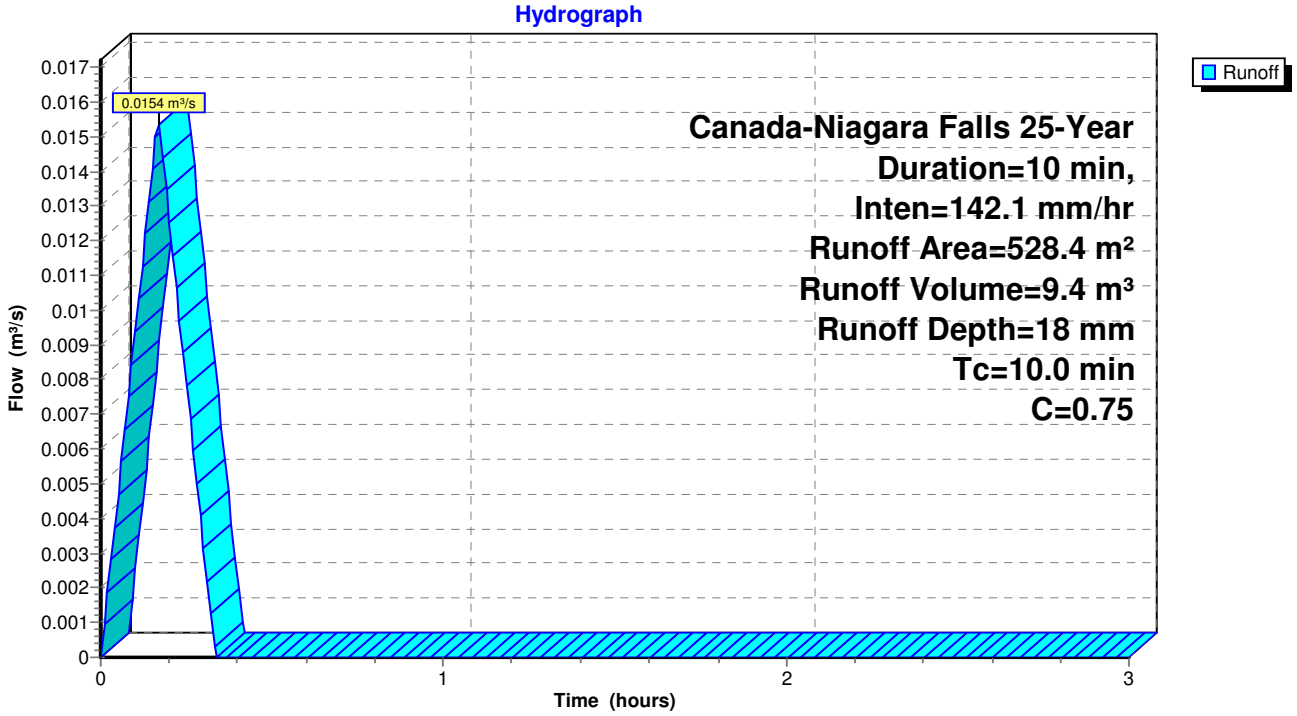
Runoff = 0.0154 m³/s @ 0.17 hrs, Volume= 9.4 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
528.4	0.75	Row Housing
528.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 44S: CA4



Summary for Subcatchment 45S: CA5

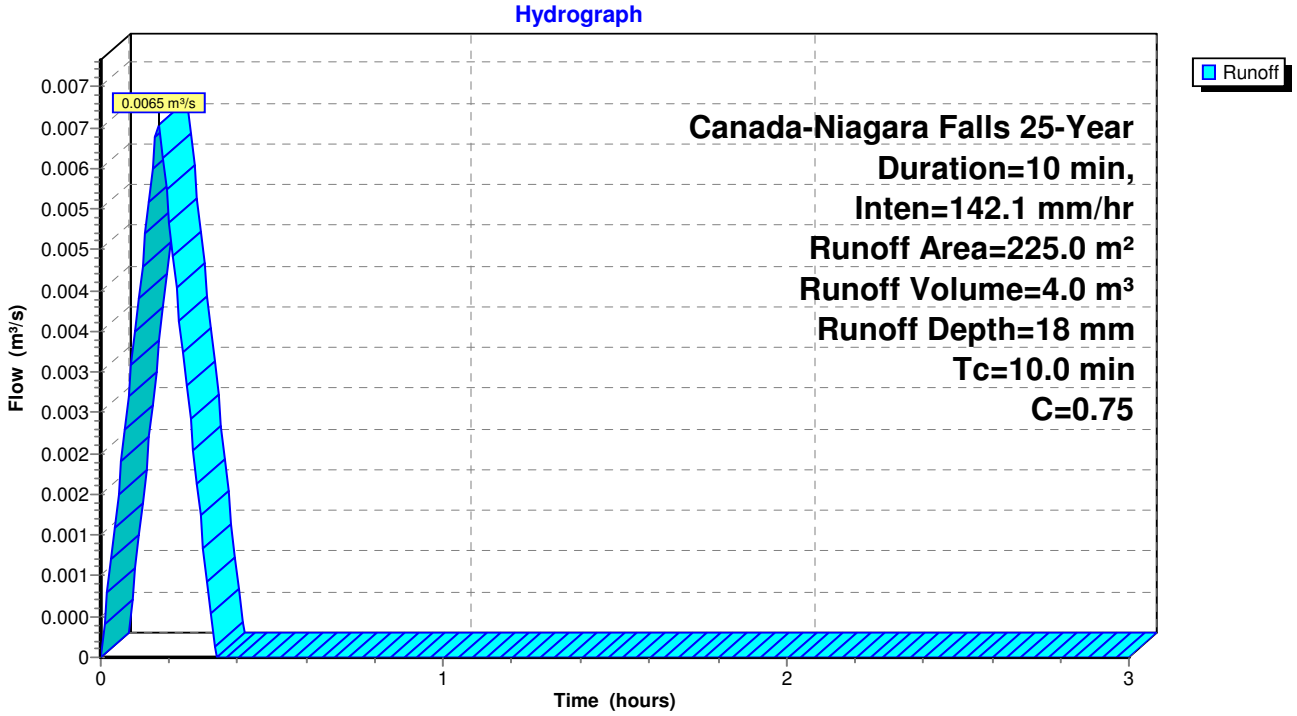
Runoff = 0.0065 m³/s @ 0.17 hrs, Volume= 4.0 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
225.0	0.75	Row Housing
225.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 45S: CA5



Summary for Subcatchment 46S: CA6

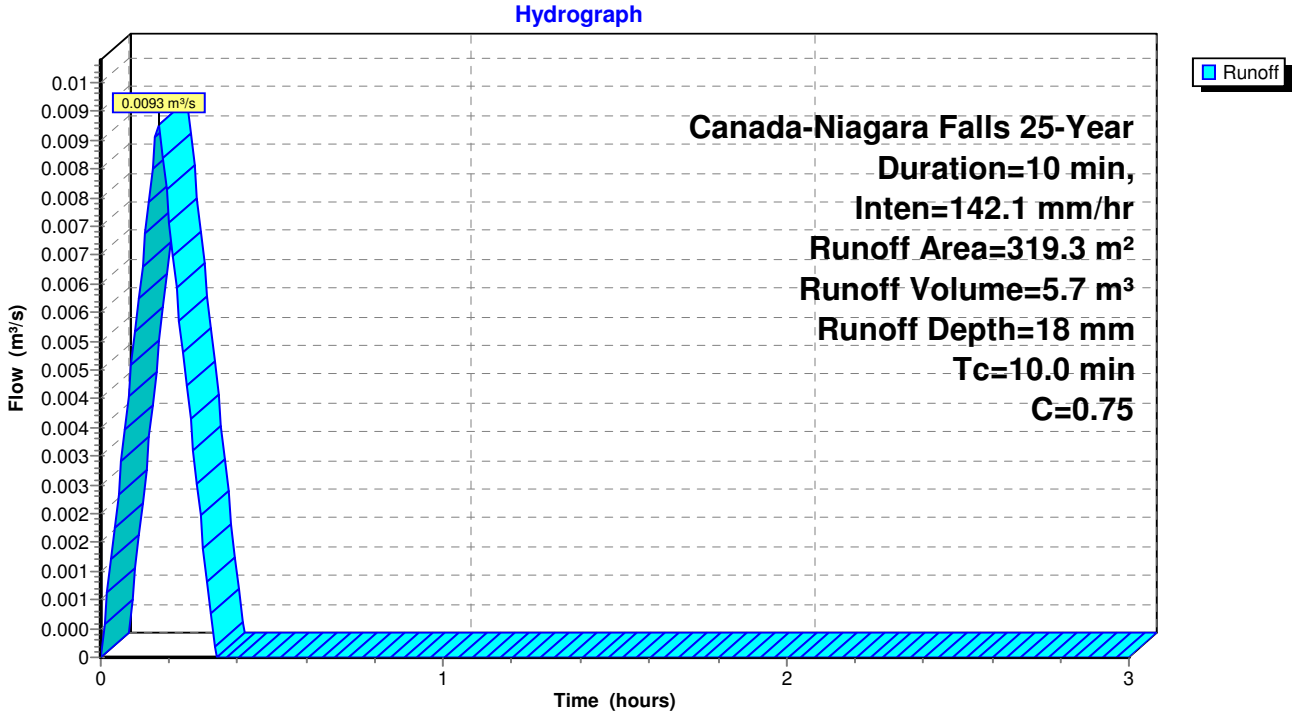
Runoff = 0.0093 m³/s @ 0.17 hrs, Volume= 5.7 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
319.3	0.75	Row Housing
319.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 46S: CA6



Summary for Subcatchment 47S: CA7

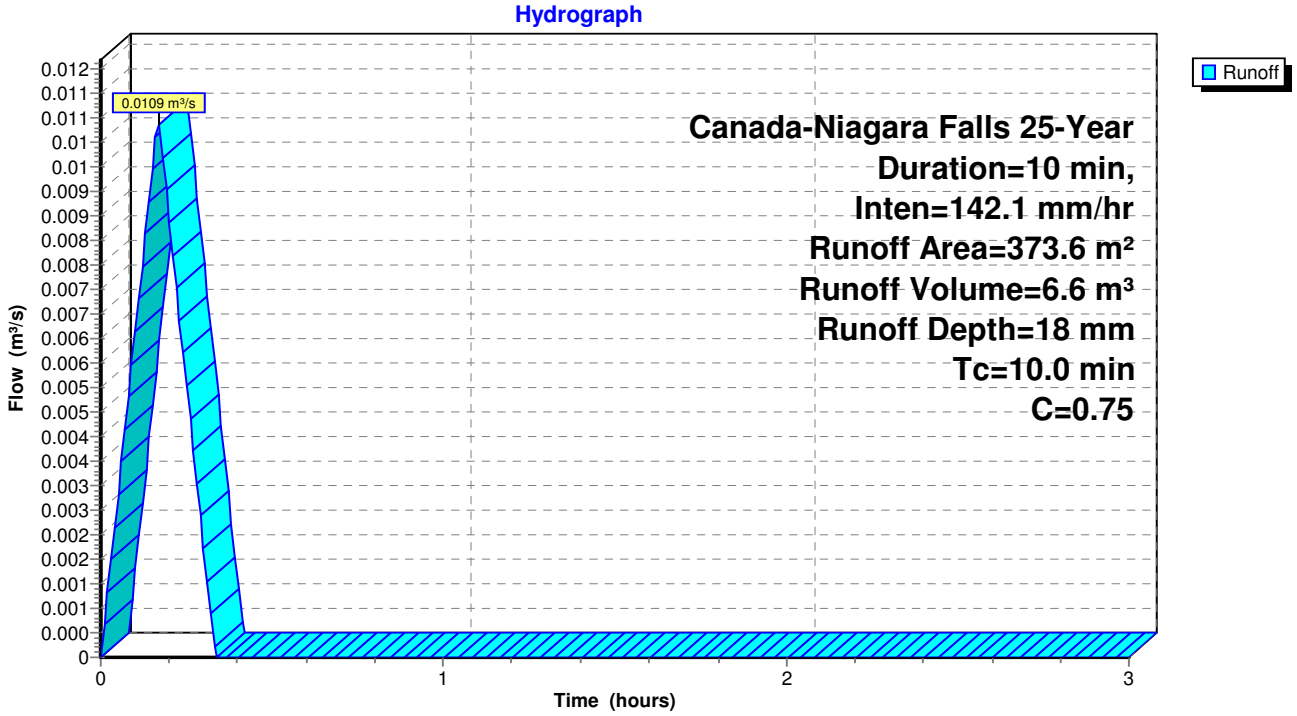
Runoff = 0.0109 m³/s @ 0.17 hrs, Volume= 6.6 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
373.6	0.75	Row Housing
373.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 47S: CA7



Summary for Subcatchment 48S: CA8

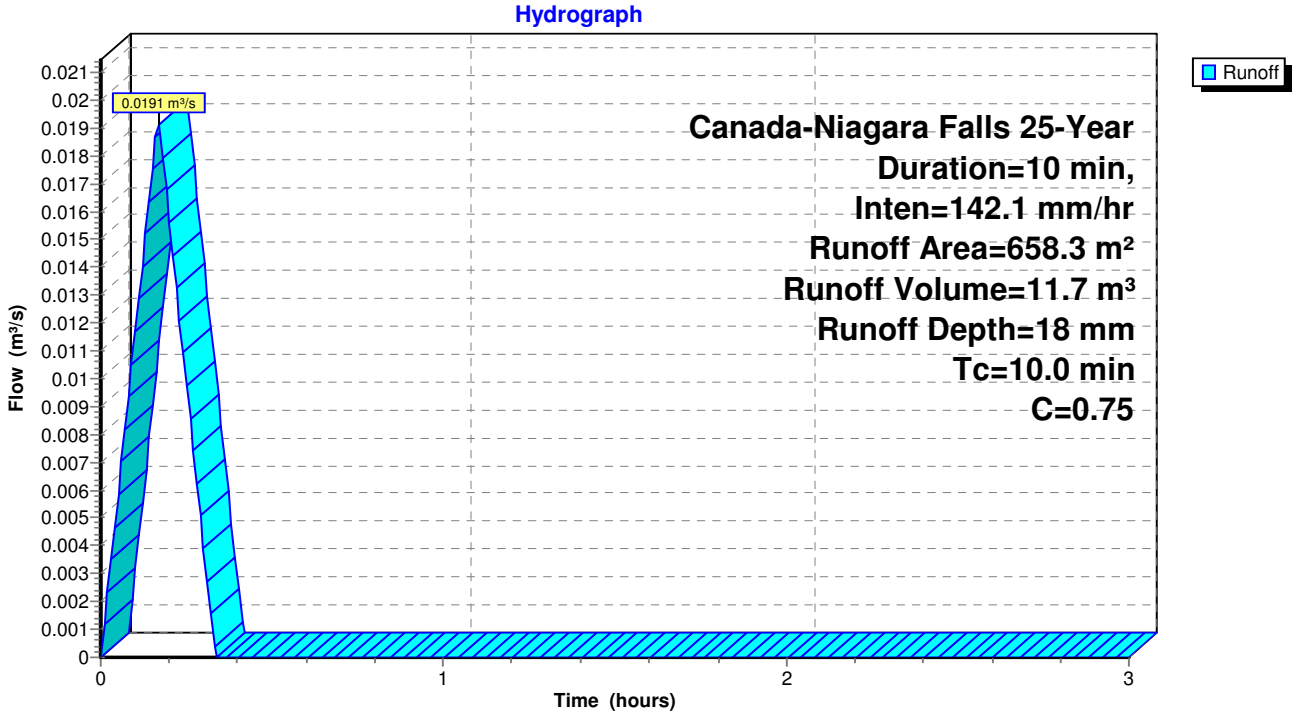
Runoff = 0.0191 m³/s @ 0.17 hrs, Volume= 11.7 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
658.3	0.75	Row Housing
658.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 48S: CA8



Summary for Subcatchment 49S: CA9

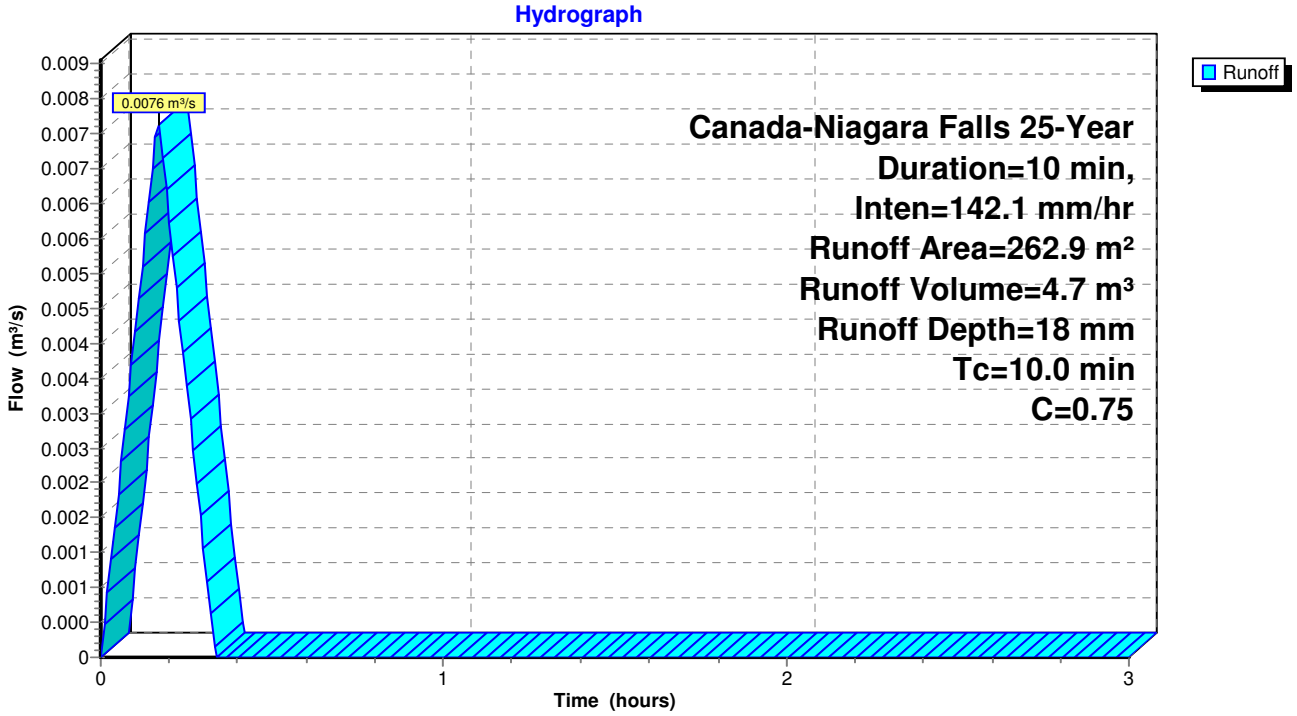
Runoff = 0.0076 m³/s @ 0.17 hrs, Volume= 4.7 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
262.9	0.75	Row Housing
262.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 49S: CA9



Summary for Subcatchment 50S: CA10

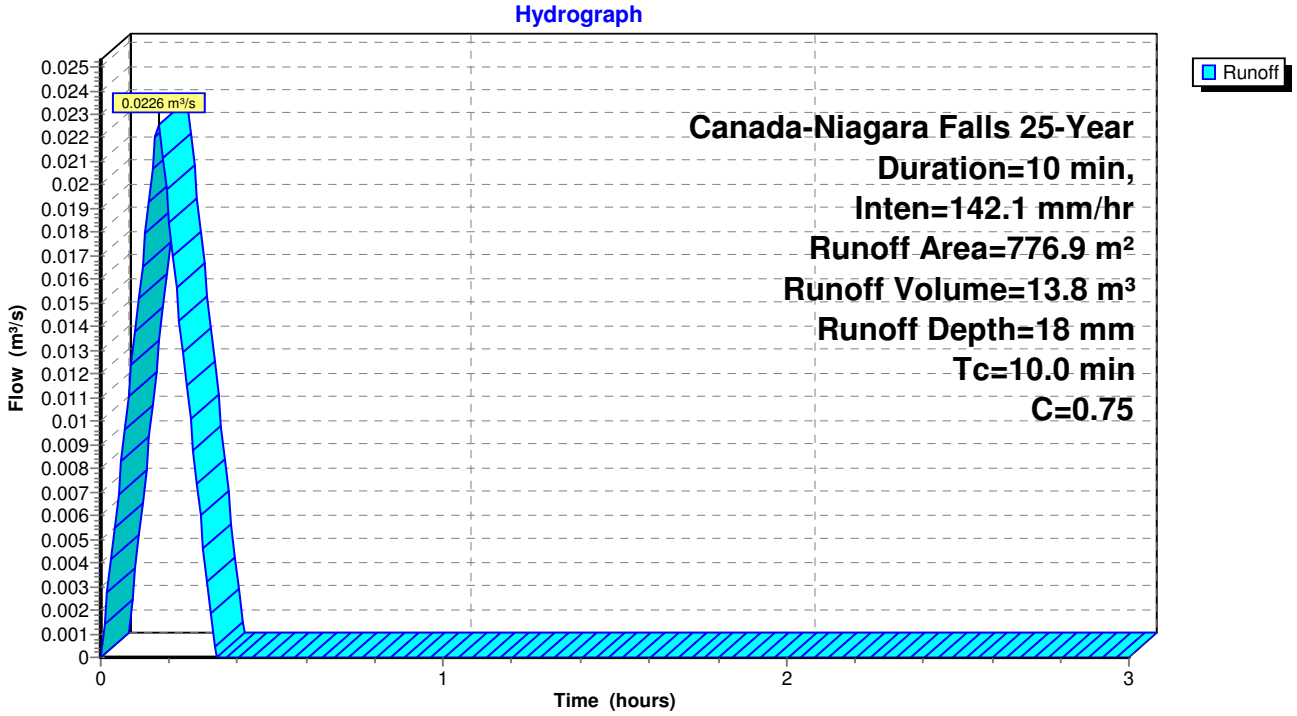
Runoff = 0.0226 m³/s @ 0.17 hrs, Volume= 13.8 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
776.9	0.75	Row Housing
776.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 50S: CA10



Summary for Subcatchment 51S: CA11

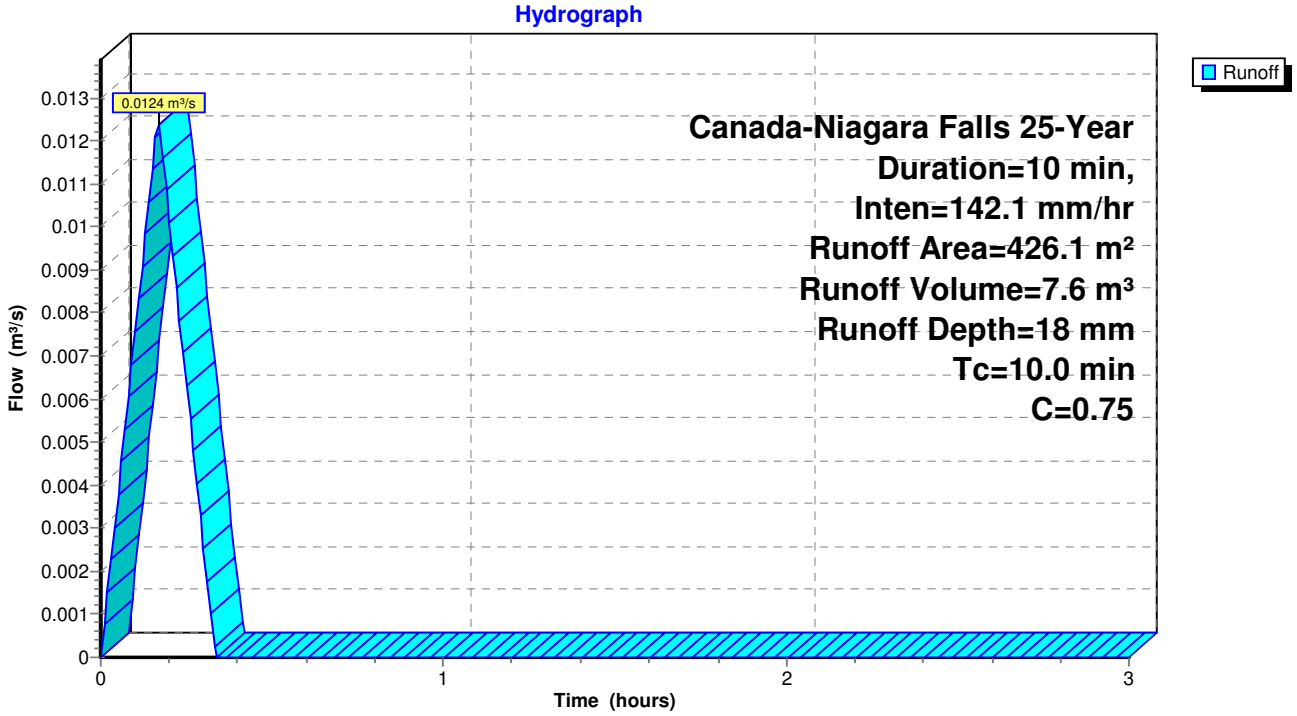
Runoff = 0.0124 m³/s @ 0.17 hrs, Volume= 7.6 m³, Depth= 18 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 25-Year Duration=10 min, Inten=142.1 mm/hr

Area (m²)	C	Description
426.1	0.75	Row Housing
426.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 51S: CA11



Summary for Pond 27P: Outlet

Inflow Area = 5,611.0 m², 0.00% Impervious, Inflow Depth = 18 mm for 25-Year event
Inflow = 0.1631 m³/s @ 0.17 hrs, Volume= 99.6 m³
Outflow = 0.0286 m³/s @ 0.30 hrs, Volume= 99.6 m³, Atten= 82%, Lag= 8.2 min
Primary = 0.0286 m³/s @ 0.30 hrs, Volume= 99.6 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 194.527 m @ 0.30 hrs Surf.Area= 391.4 m² Storage= 77.0 m³
Flood Elev= 194.600 m Surf.Area= 728.8 m² Storage= 117.3 m³

Plug-Flow detention time= 29.1 min calculated for 99.3 m³ (100% of inflow)
Center-of-Mass det. time= 29.3 min (39.3 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	194.400 m	12.3 m³	**Ponding Area 1 (Prismatic)** Listed below (Recalc)
#2	194.500 m	6.2 m³	**Ponding Area 2 (Prismatic)** Listed below (Recalc)
#3	194.500 m	6.2 m³	**Ponding Area 3 (Prismatic)** Listed below (Recalc)
#4	194.450 m	4.1 m³	**Ponding Area 5 (Prismatic)** Listed below (Recalc)
#5	194.400 m	18.4 m³	**Ponding Area 4 (Prismatic)** Listed below (Recalc)
#6	194.200 m	22.5 m³	**Ponding Area 6 (Prismatic)** Listed below (Recalc)
#7	192.680 m	7.1 m³	**600 mm Round Pipe Storage** L= 25.00 m S= 0.0040 m/m
#8	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#9	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#10	192.800 m	7.7 m³	**1.20 mD x 1.70 mH mh** x 4
#11	192.600 m	6.8 m³	**0.60 mD x 2.40 mH Catcbasin** x 10
		118.4 m³	Total Available Storage

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	122.4	12.3	12.3

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.450	0.3	0.0	0.0
194.600	55.0	4.1	4.1

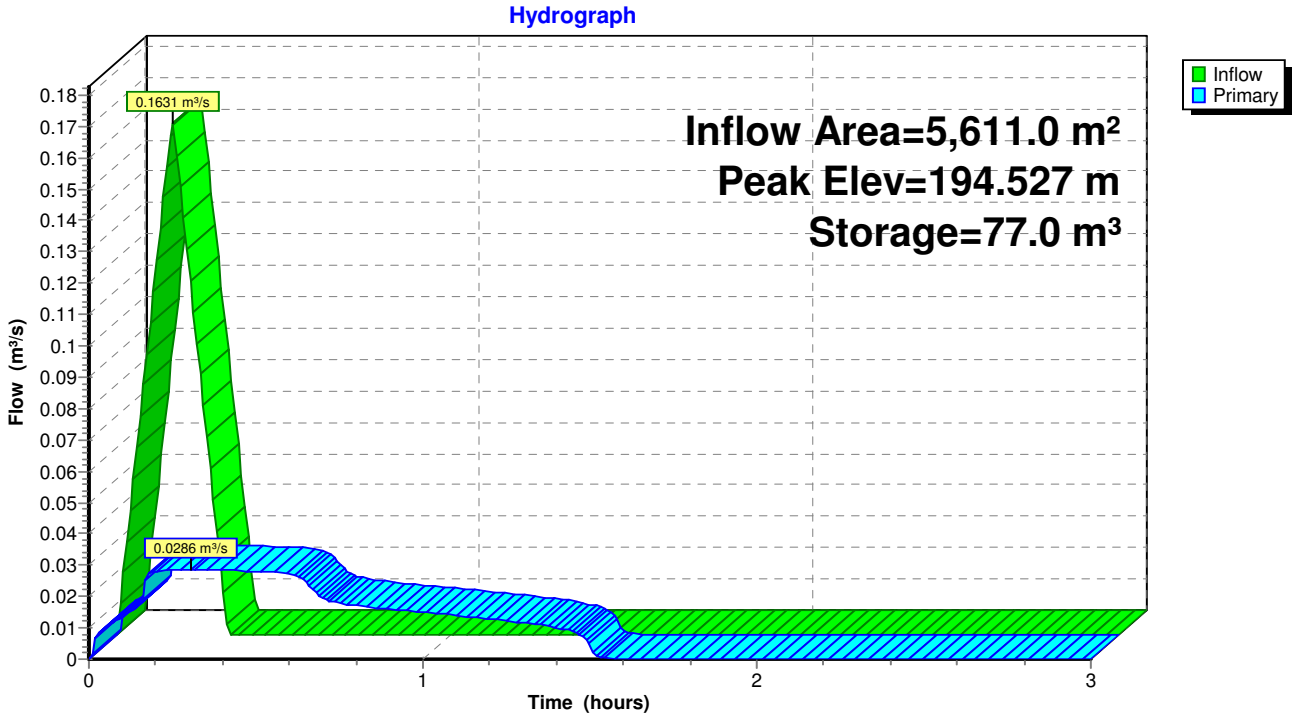
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	184.0	18.4	18.4

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.200	0.3	0.0	0.0
194.600	112.0	22.5	22.5

Device	Routing	Invert	Outlet Devices
#1	Primary	192.600 m	**100 mm Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.0286 m³/s @ 0.30 hrs HW=194.527 m (Free Discharge)
↳1=Orifice/Grate (Orifice Controls 0.0286 m³/s @ 3.64 m/s)

Pond 27P: Outlet



Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 28S: CA1 Runoff Area=629.7 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0203 m³/s 12.4 m³

Subcatchment 29S: Pre Development Area Runoff Area=5,611.0 m² 0.00% Impervious Runoff Depth=16 mm
Tc=10.0 min C=0.60 Runoff=0.1450 m³/s 88.5 m³

Subcatchment 42S: CA2 Runoff Area=717.0 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0232 m³/s 14.1 m³

Subcatchment 43S: CA3 Runoff Area=693.8 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0224 m³/s 13.7 m³

Subcatchment 44S: CA4 Runoff Area=528.4 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0171 m³/s 10.4 m³

Subcatchment 45S: CA5 Runoff Area=225.0 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0073 m³/s 4.4 m³

Subcatchment 46S: CA6 Runoff Area=319.3 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0103 m³/s 6.3 m³

Subcatchment 47S: CA7 Runoff Area=373.6 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0121 m³/s 7.4 m³

Subcatchment 48S: CA8 Runoff Area=658.3 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0213 m³/s 13.0 m³

Subcatchment 49S: CA9 Runoff Area=262.9 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0085 m³/s 5.2 m³

Subcatchment 50S: CA10 Runoff Area=776.9 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0251 m³/s 15.3 m³

Subcatchment 51S: CA11 Runoff Area=426.1 m² 0.00% Impervious Runoff Depth=20 mm
Tc=10.0 min C=0.75 Runoff=0.0138 m³/s 8.4 m³

Pond 27P: Outlet Peak Elev=194.551 m Storage=87.2 m³ Inflow=0.1812 m³/s 110.6 m³
Outflow=0.0288 m³/s 110.6 m³

Total Runoff Area = 11,222.0 m² Runoff Volume = 199.1 m³ Average Runoff Depth = 18 mm
100.00% Pervious = 11,222.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 28S: CA1

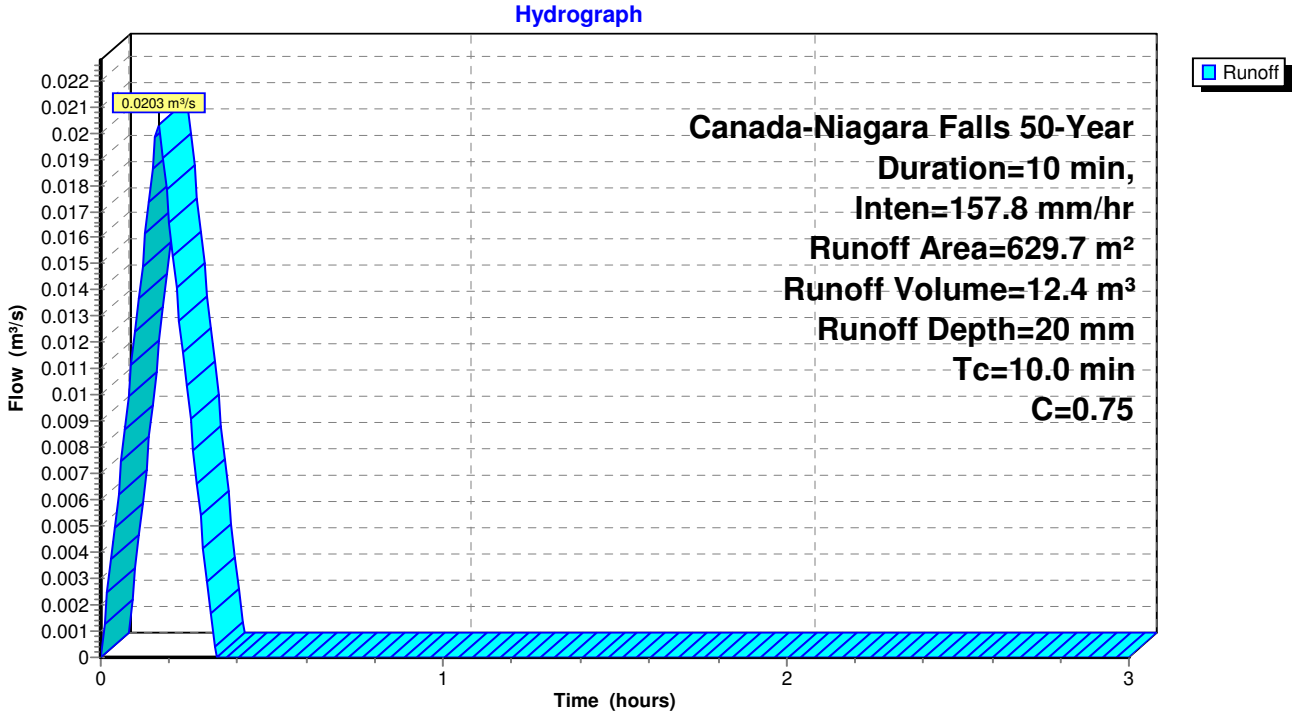
Runoff = 0.0203 m³/s @ 0.17 hrs, Volume= 12.4 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
629.7	0.75	Row Housing
629.7		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 28S: CA1



Summary for Subcatchment 29S: Pre Development Area 1

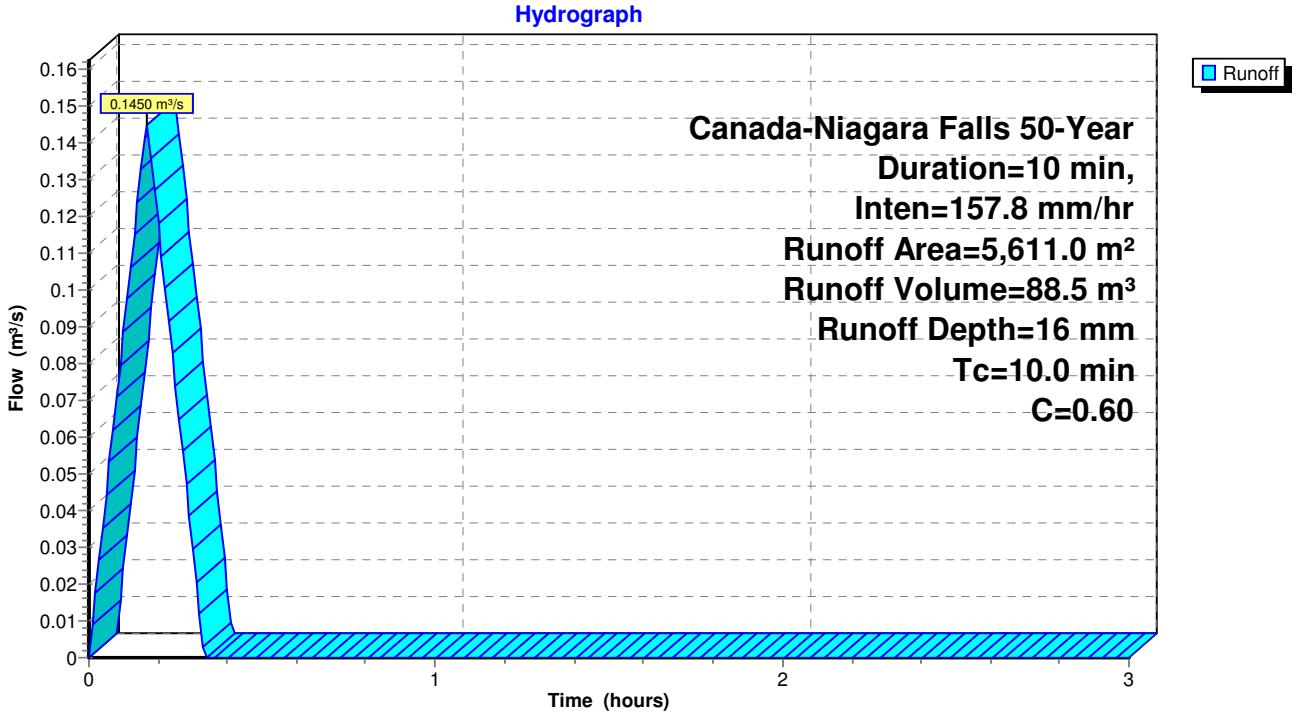
Runoff = 0.1450 m³/s @ 0.17 hrs, Volume= 88.5 m³, Depth= 16 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
5,611.0	0.60	Existing Single Family
5,611.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 29S: Pre Development Area 1



Summary for Subcatchment 42S: CA2

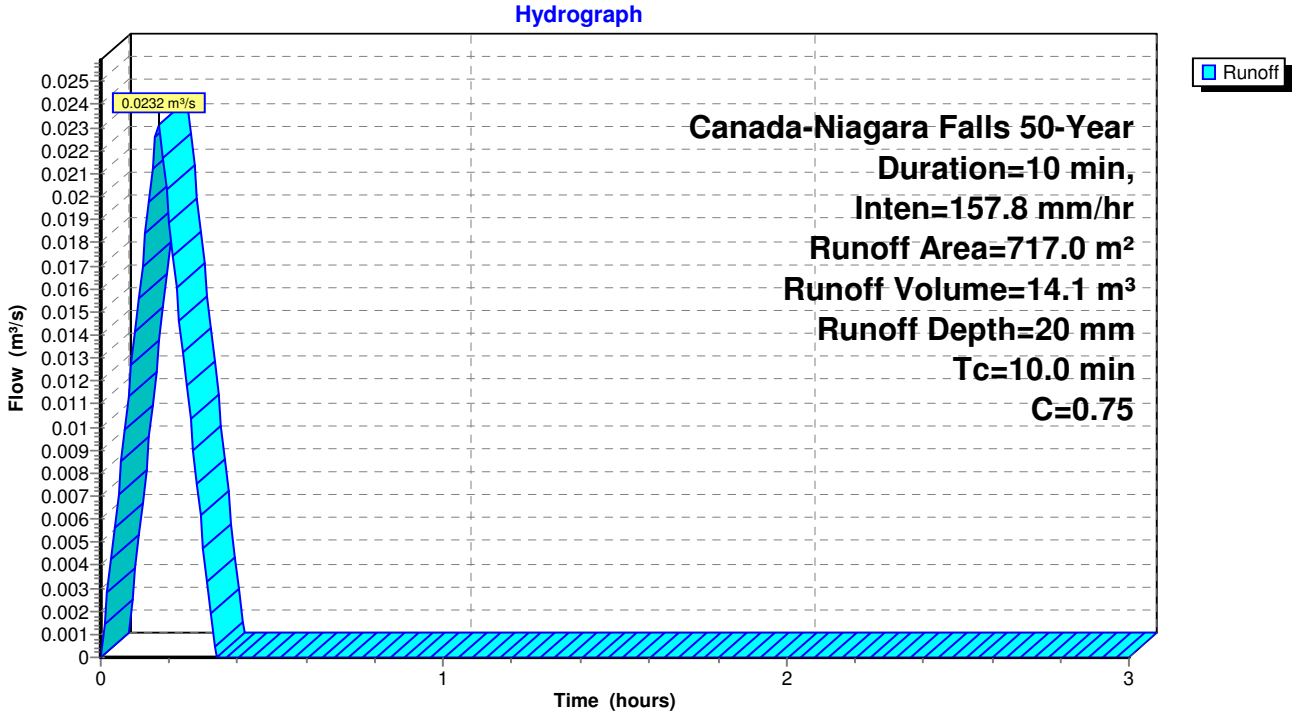
Runoff = 0.0232 m³/s @ 0.17 hrs, Volume= 14.1 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
717.0	0.75	Row Housing
717.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 42S: CA2



Summary for Subcatchment 43S: CA3

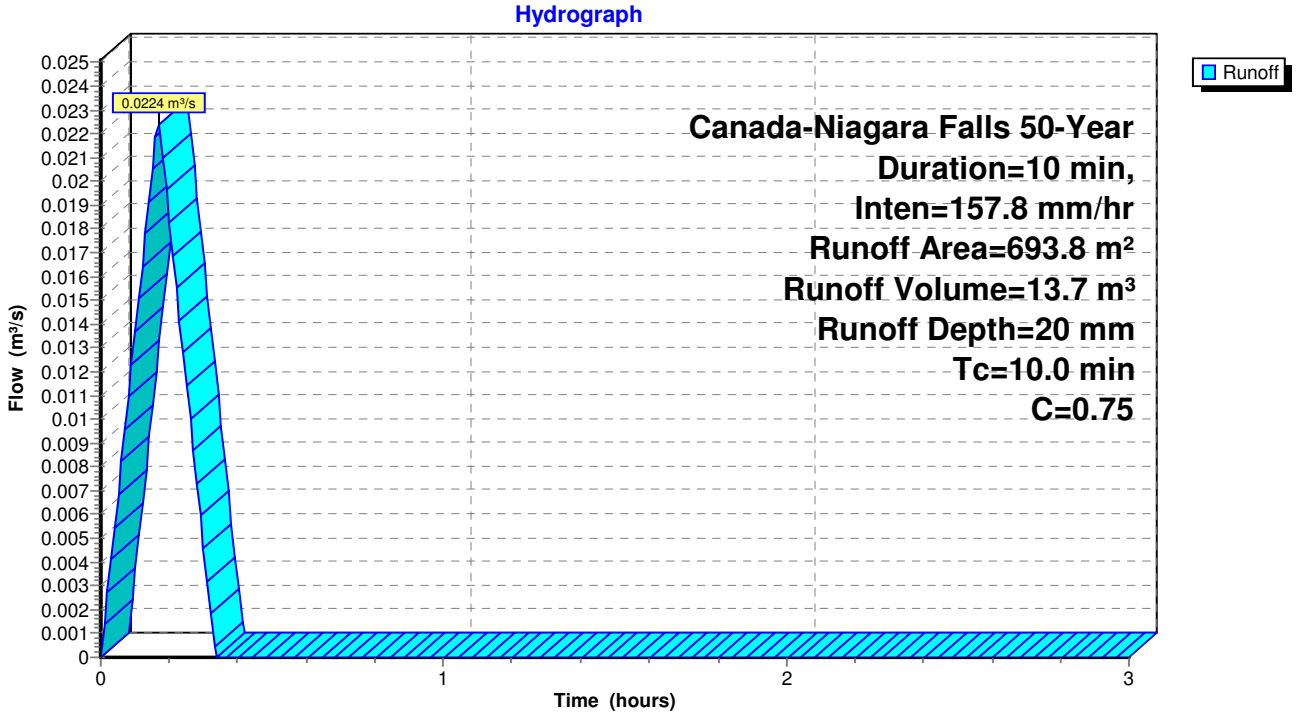
Runoff = 0.0224 m³/s @ 0.17 hrs, Volume= 13.7 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
693.8	0.75	Row Housing
693.8		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 43S: CA3



Summary for Subcatchment 44S: CA4

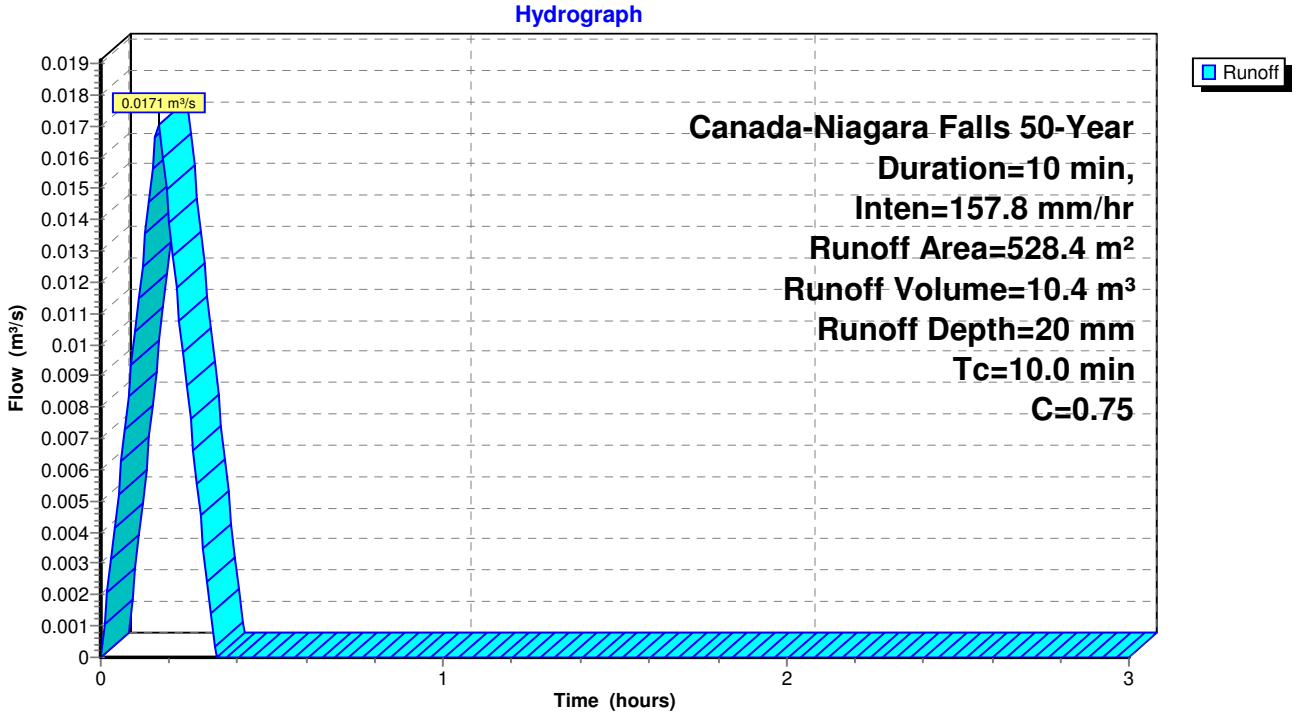
Runoff = 0.0171 m³/s @ 0.17 hrs, Volume= 10.4 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
528.4	0.75	Row Housing
528.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 44S: CA4



Summary for Subcatchment 45S: CA5

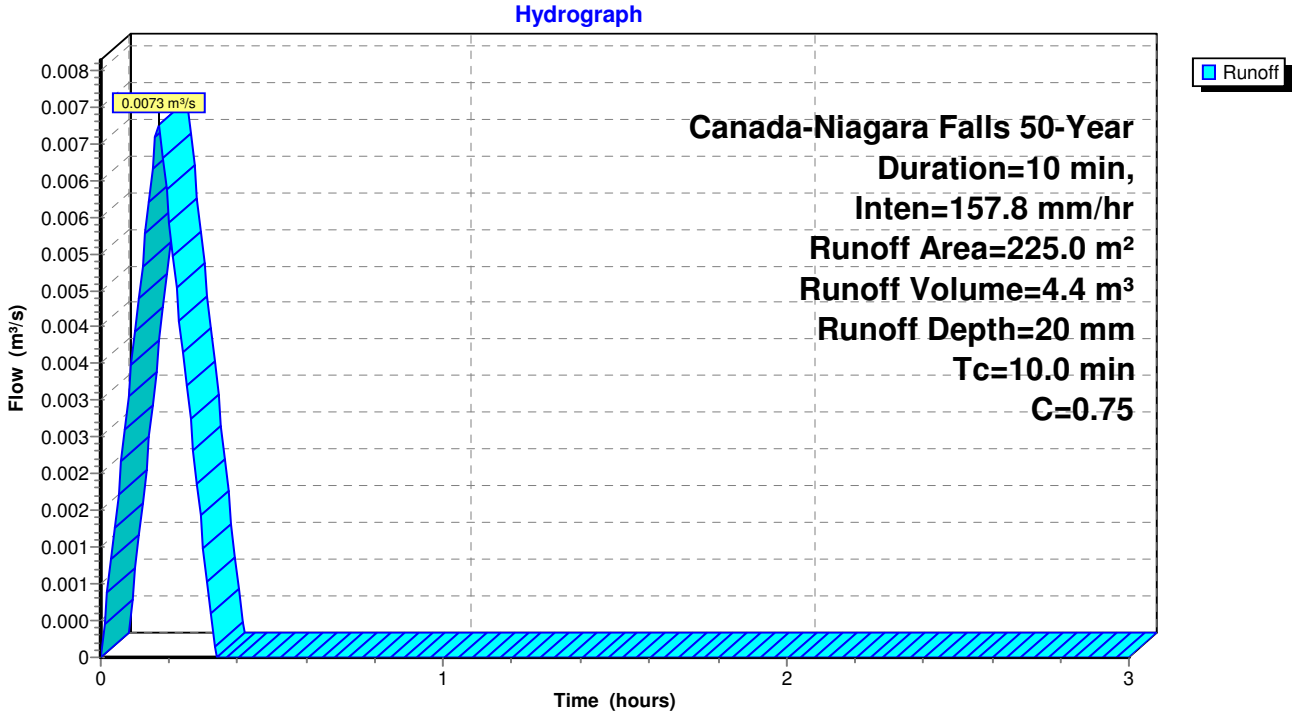
Runoff = 0.0073 m³/s @ 0.17 hrs, Volume= 4.4 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
225.0	0.75	Row Housing
225.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 45S: CA5



Summary for Subcatchment 46S: CA6

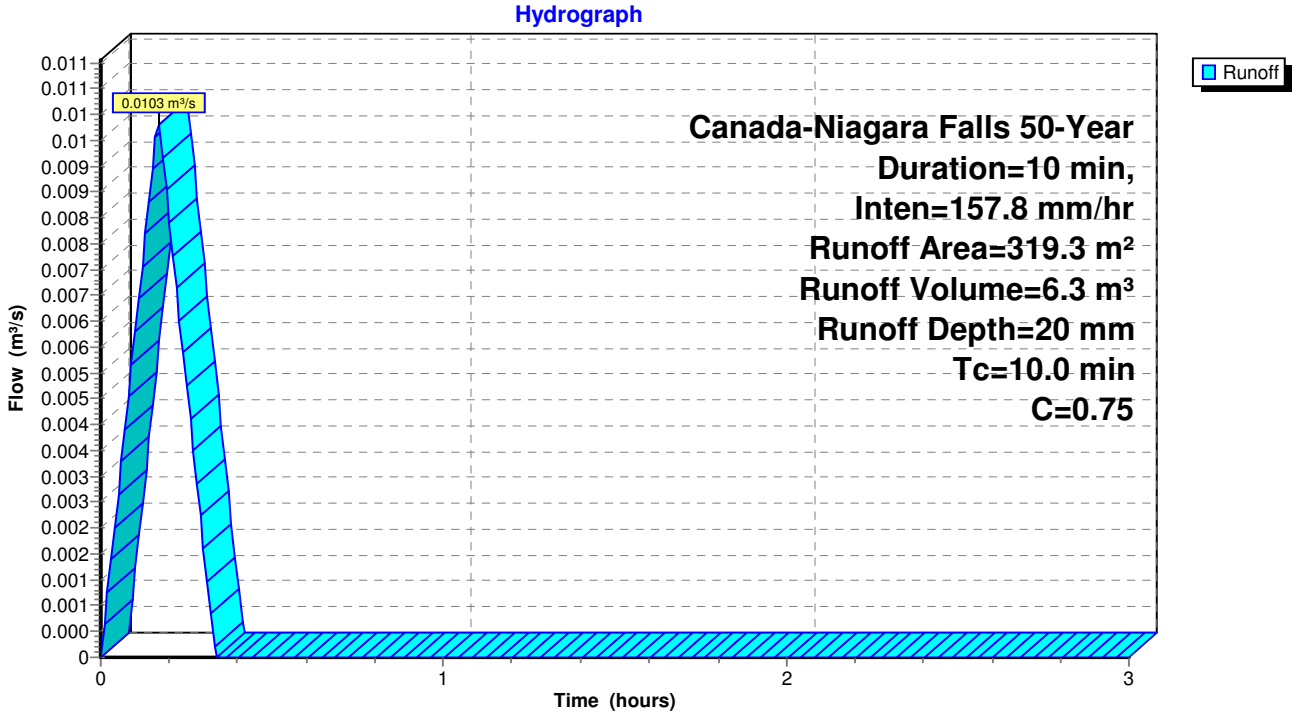
Runoff = 0.0103 m³/s @ 0.17 hrs, Volume= 6.3 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
319.3	0.75	Row Housing
319.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 46S: CA6



Summary for Subcatchment 47S: CA7

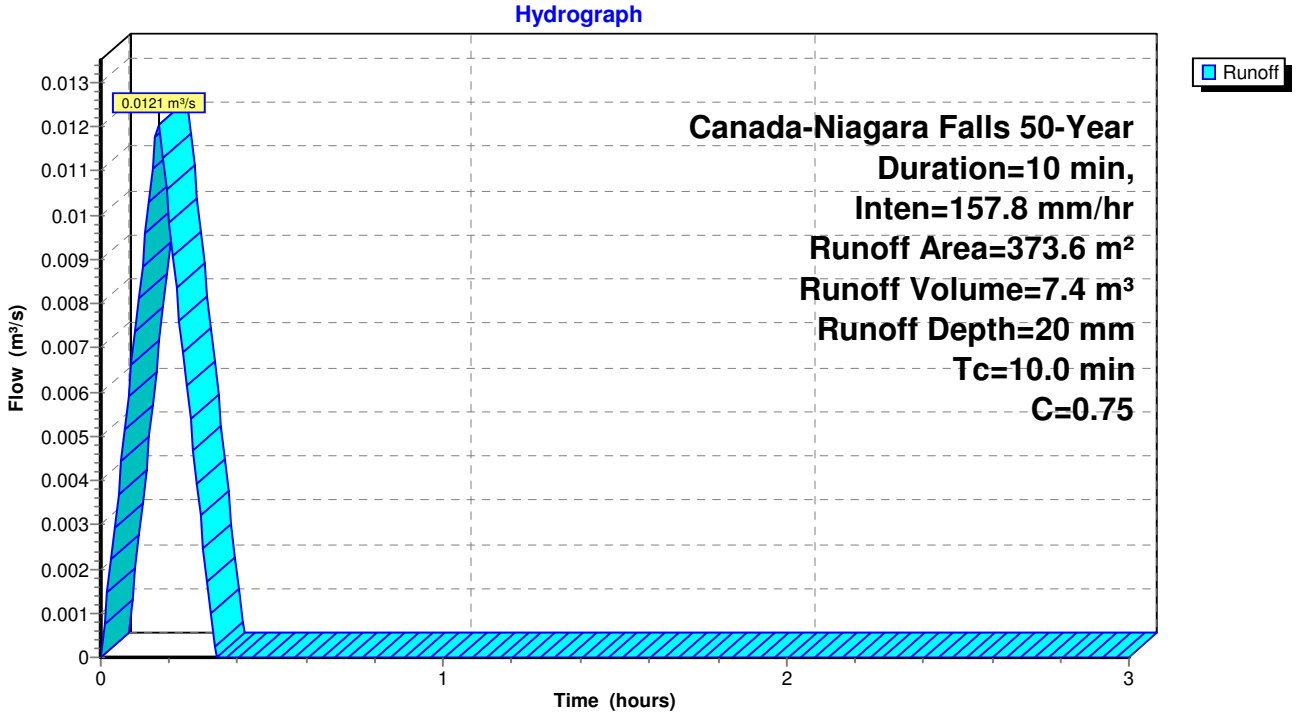
Runoff = 0.0121 m³/s @ 0.17 hrs, Volume= 7.4 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
373.6	0.75	Row Housing
373.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 47S: CA7



Summary for Subcatchment 48S: CA8

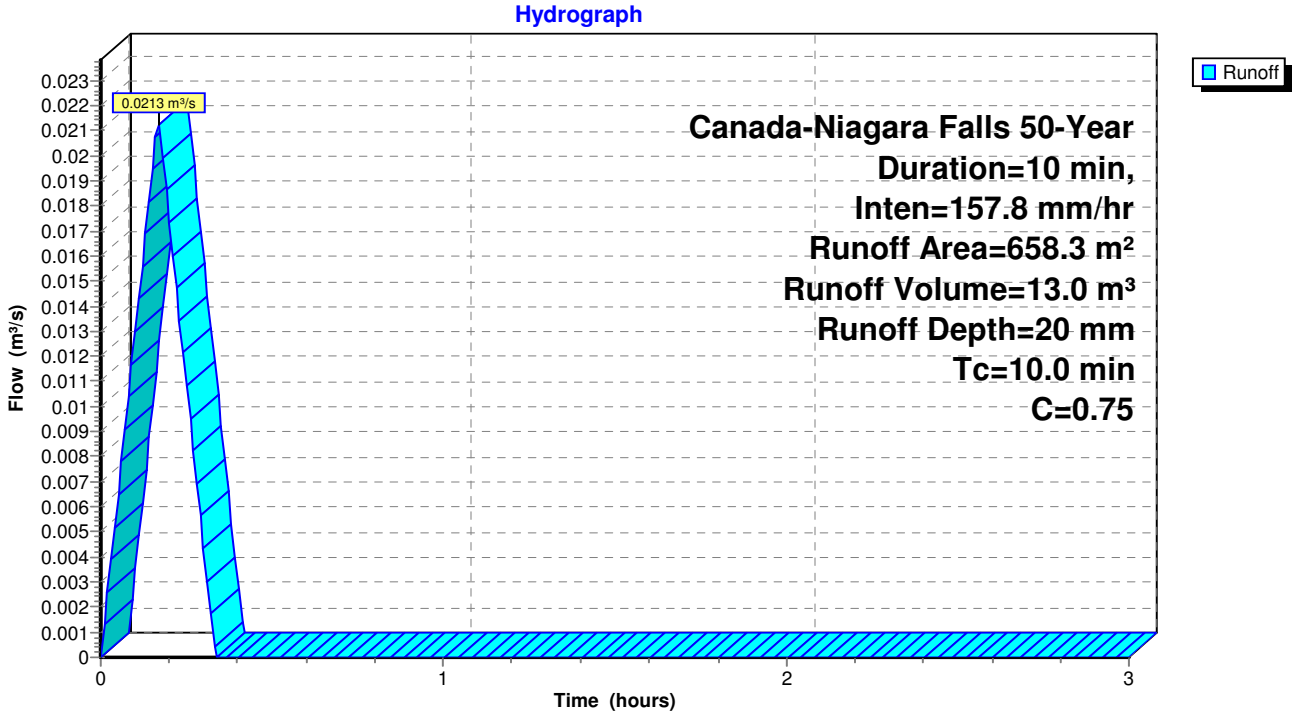
Runoff = 0.0213 m³/s @ 0.17 hrs, Volume= 13.0 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
658.3	0.75	Row Housing
658.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 48S: CA8



Summary for Subcatchment 49S: CA9

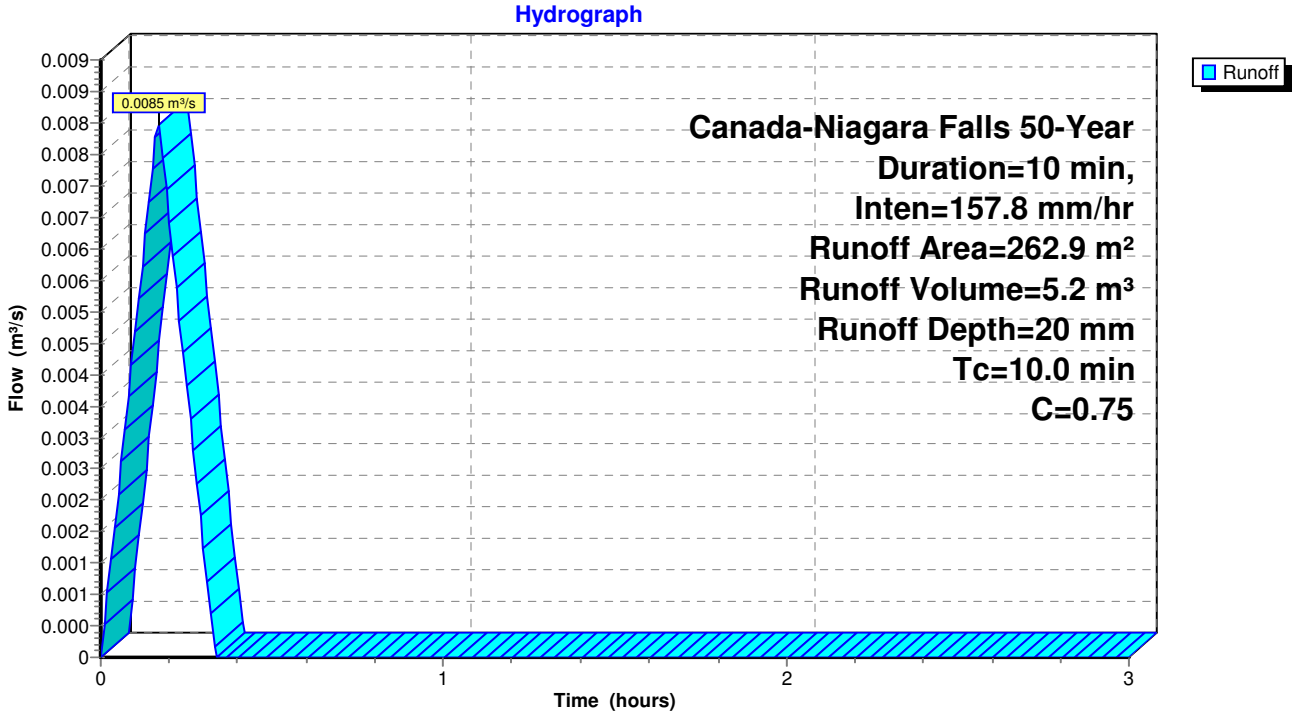
Runoff = 0.0085 m³/s @ 0.17 hrs, Volume= 5.2 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
262.9	0.75	Row Housing
262.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 49S: CA9



Summary for Subcatchment 50S: CA10

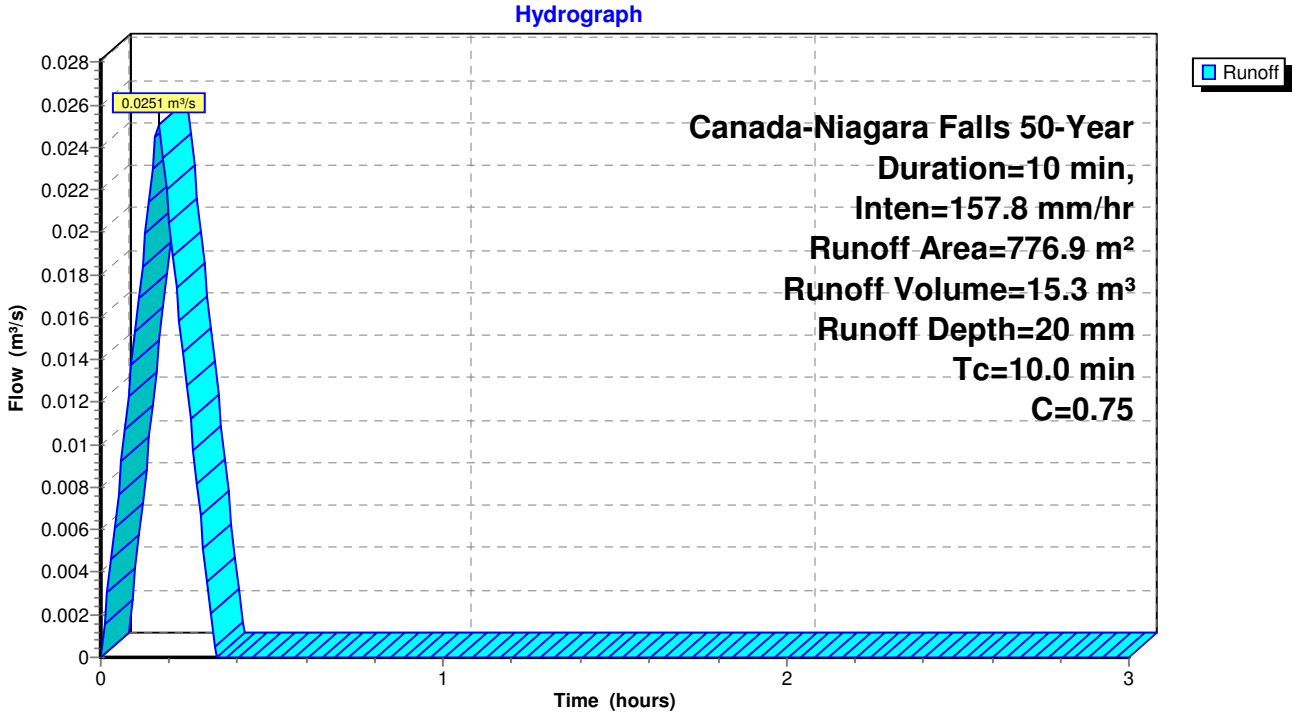
Runoff = 0.0251 m³/s @ 0.17 hrs, Volume= 15.3 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
776.9	0.75	Row Housing
776.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 50S: CA10



Summary for Subcatchment 51S: CA11

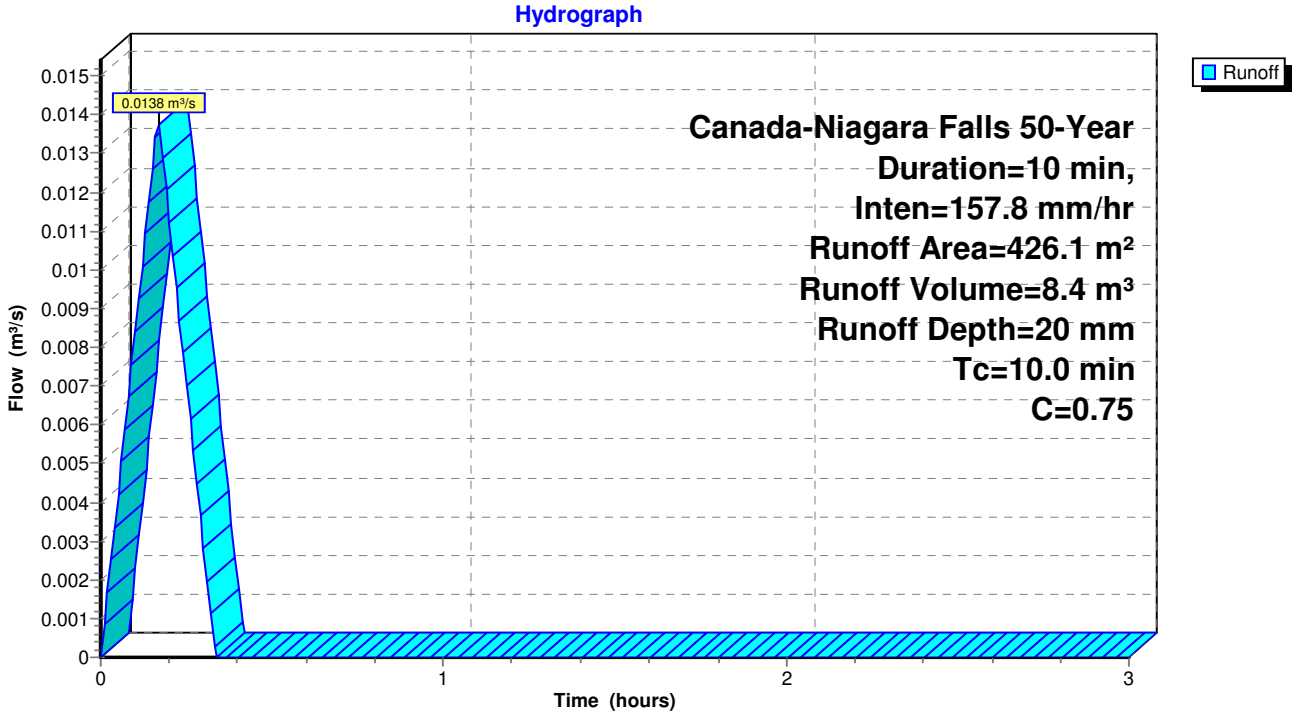
Runoff = 0.0138 m³/s @ 0.17 hrs, Volume= 8.4 m³, Depth= 20 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 50-Year Duration=10 min, Inten=157.8 mm/hr

Area (m²)	C	Description
426.1	0.75	Row Housing
426.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 51S: CA11



Summary for Pond 27P: Outlet

Inflow Area = 5,611.0 m², 0.00% Impervious, Inflow Depth = 20 mm for 50-Year event
Inflow = 0.1812 m³/s @ 0.17 hrs, Volume= 110.6 m³
Outflow = 0.0288 m³/s @ 0.31 hrs, Volume= 110.6 m³, Atten= 84%, Lag= 8.4 min
Primary = 0.0288 m³/s @ 0.31 hrs, Volume= 110.6 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 194.551 m @ 0.31 hrs Surf.Area= 499.4 m² Storage= 87.2 m³
Flood Elev= 194.600 m Surf.Area= 728.8 m² Storage= 117.3 m³

Plug-Flow detention time= 31.5 min calculated for 110.3 m³ (100% of inflow)
Center-of-Mass det. time= 31.7 min (41.7 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	194.400 m	12.3 m³	**Ponding Area 1 (Prismatic)** Listed below (Recalc)
#2	194.500 m	6.2 m³	**Ponding Area 2 (Prismatic)** Listed below (Recalc)
#3	194.500 m	6.2 m³	**Ponding Area 3 (Prismatic)** Listed below (Recalc)
#4	194.450 m	4.1 m³	**Ponding Area 5 (Prismatic)** Listed below (Recalc)
#5	194.400 m	18.4 m³	**Ponding Area 4 (Prismatic)** Listed below (Recalc)
#6	194.200 m	22.5 m³	**Ponding Area 6 (Prismatic)** Listed below (Recalc)
#7	192.680 m	7.1 m³	**600 mm Round Pipe Storage** L= 25.00 m S= 0.0040 m/m
#8	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#9	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#10	192.800 m	7.7 m³	**1.20 mD x 1.70 mH mh** x 4
#11	192.600 m	6.8 m³	**0.60 mD x 2.40 mH Catcbasin** x 10
		118.4 m³	Total Available Storage

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	122.4	12.3	12.3

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.450	0.3	0.0	0.0
194.600	55.0	4.1	4.1

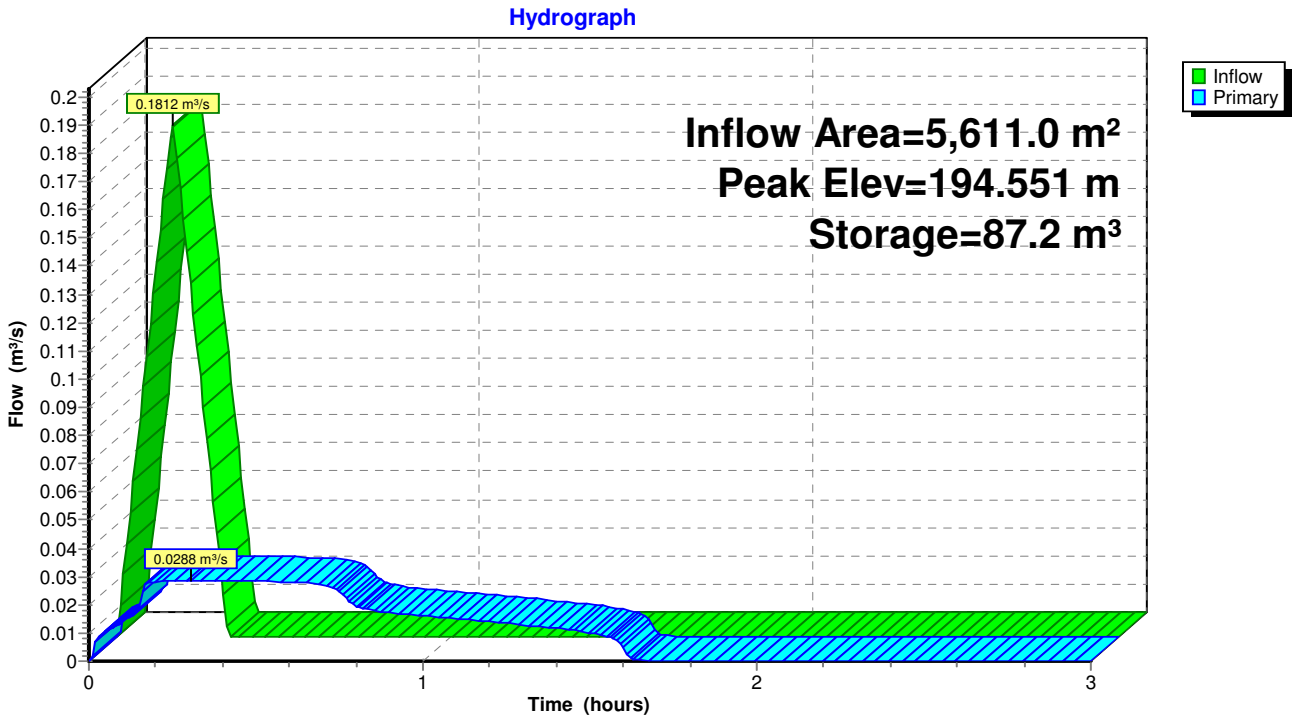
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	184.0	18.4	18.4

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.200	0.3	0.0	0.0
194.600	112.0	22.5	22.5

Device	Routing	Invert	Outlet Devices
#1	Primary	192.600 m	**100 mm Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.0288 m³/s @ 0.31 hrs HW=194.551 m (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.0288 m³/s @ 3.66 m/s)

Pond 27P: Outlet



Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 28S: CA1 Runoff Area=629.7 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0223 m³/s 13.6 m³

Subcatchment 29S: Pre Development Area Runoff Area=5,611.0 m² 0.00% Impervious Runoff Depth=17 mm
Tc=10.0 min C=0.60 Runoff=0.1591 m³/s 97.1 m³

Subcatchment 42S: CA2 Runoff Area=717.0 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0254 m³/s 15.5 m³

Subcatchment 43S: CA3 Runoff Area=693.8 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0246 m³/s 15.0 m³

Subcatchment 44S: CA4 Runoff Area=528.4 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0187 m³/s 11.4 m³

Subcatchment 45S: CA5 Runoff Area=225.0 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0080 m³/s 4.9 m³

Subcatchment 46S: CA6 Runoff Area=319.3 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0113 m³/s 6.9 m³

Subcatchment 47S: CA7 Runoff Area=373.6 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0132 m³/s 8.1 m³

Subcatchment 48S: CA8 Runoff Area=658.3 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0233 m³/s 14.2 m³

Subcatchment 49S: CA9 Runoff Area=262.9 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0093 m³/s 5.7 m³

Subcatchment 50S: CA10 Runoff Area=776.9 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0275 m³/s 16.8 m³

Subcatchment 51S: CA11 Runoff Area=426.1 m² 0.00% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.75 Runoff=0.0151 m³/s 9.2 m³

Pond 27P: Outlet Peak Elev=194.569 m Storage=97.4 m³ Inflow=0.1989 m³/s 121.4 m³
Outflow=0.0289 m³/s 121.4 m³

Total Runoff Area = 11,222.0 m² Runoff Volume = 218.6 m³ Average Runoff Depth = 19 mm
100.00% Pervious = 11,222.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 28S: CA1

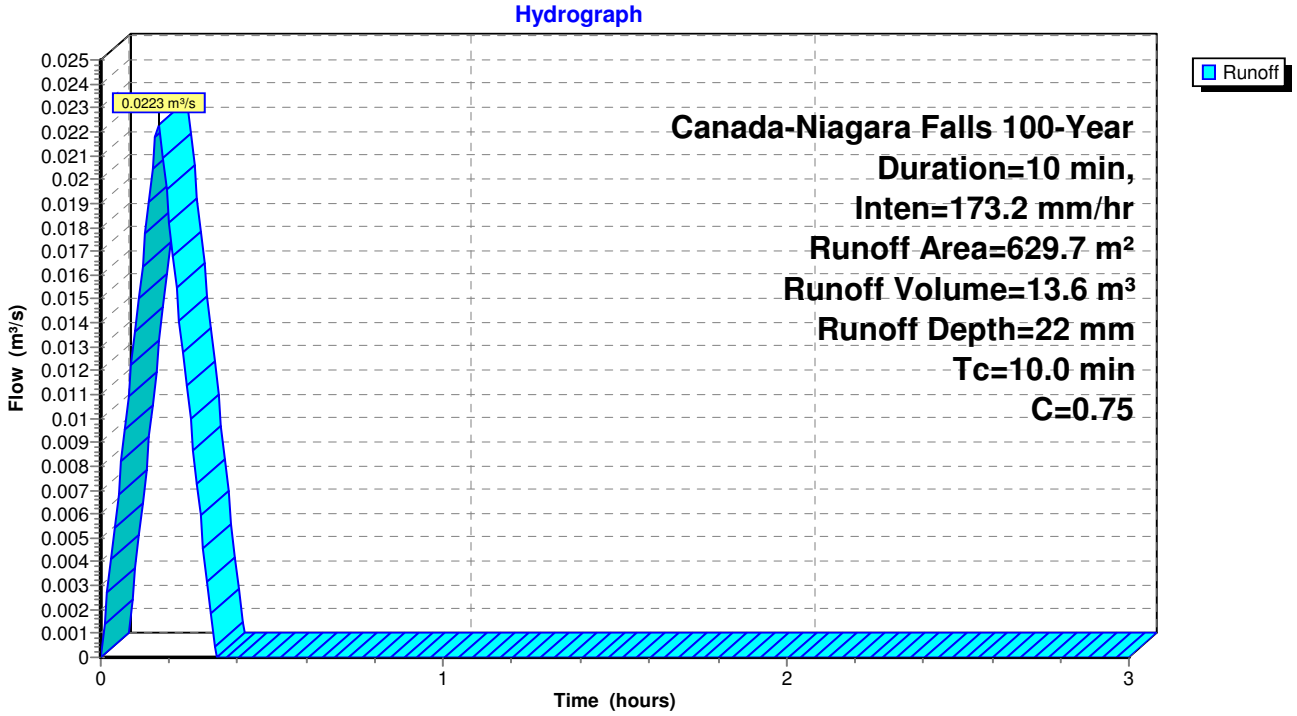
Runoff = 0.0223 m³/s @ 0.17 hrs, Volume= 13.6 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
629.7	0.75	Row Housing
629.7		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 28S: CA1



Summary for Subcatchment 29S: Pre Development Area 1

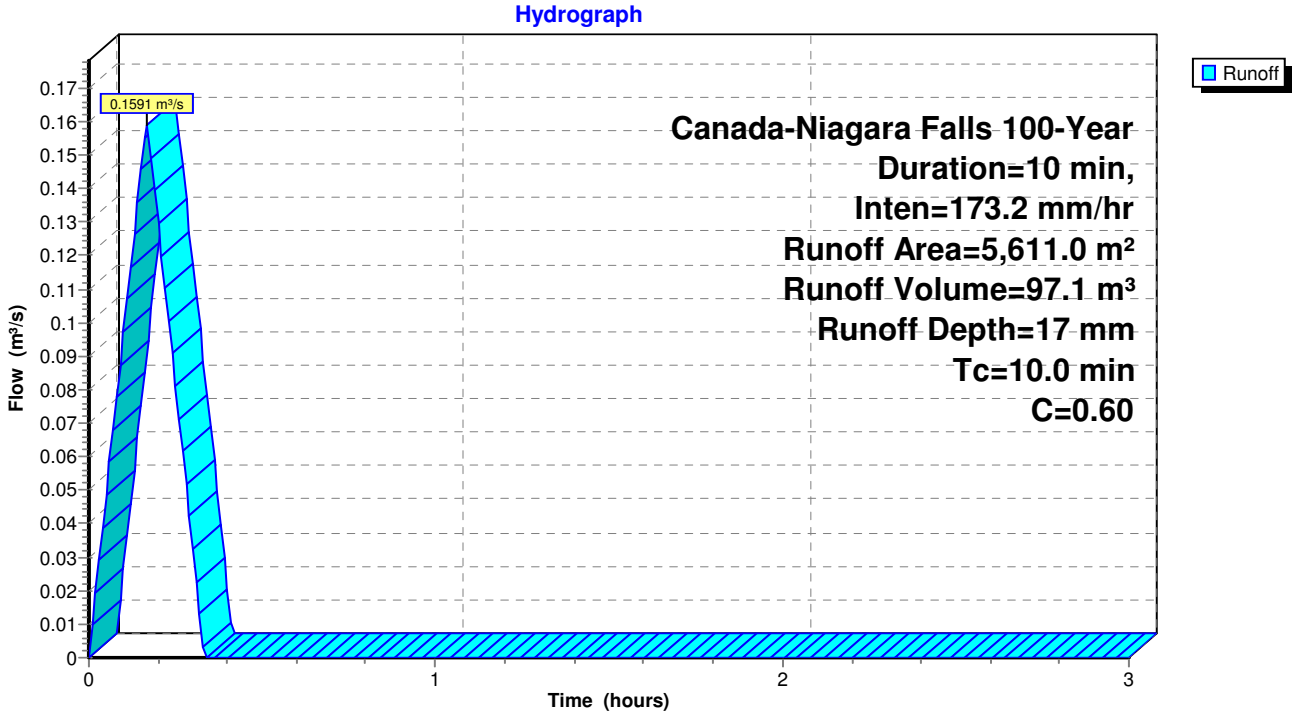
Runoff = 0.1591 m³/s @ 0.17 hrs, Volume= 97.1 m³, Depth= 17 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
5,611.0	0.60	Existing Single Family
5,611.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 29S: Pre Development Area 1



Summary for Subcatchment 42S: CA2

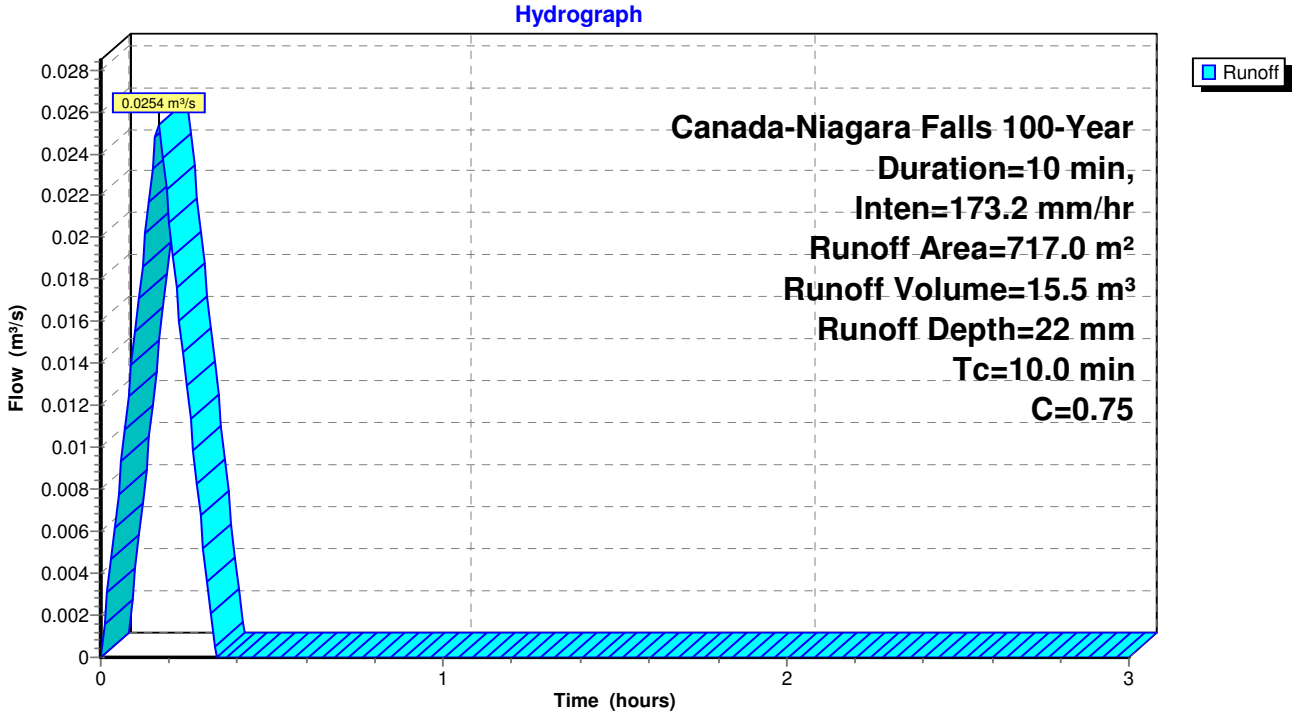
Runoff = 0.0254 m³/s @ 0.17 hrs, Volume= 15.5 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
717.0	0.75	Row Housing
717.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 42S: CA2



Summary for Subcatchment 43S: CA3

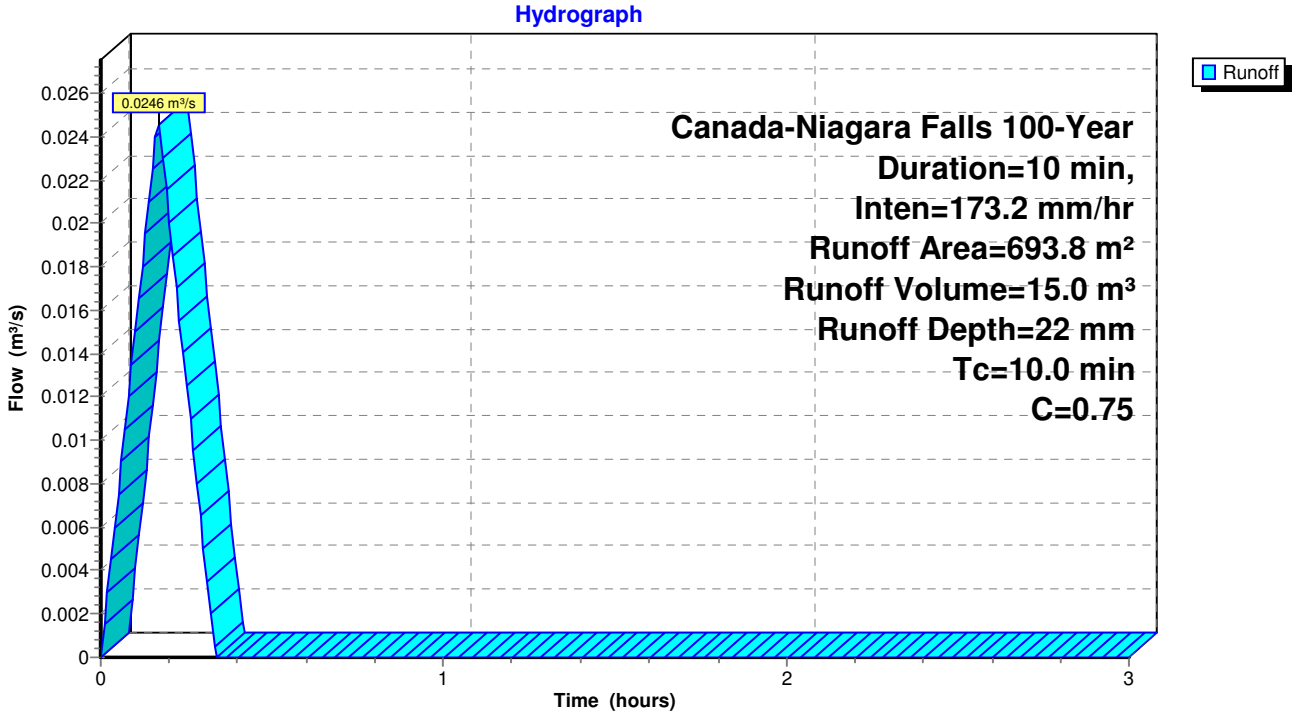
Runoff = 0.0246 m³/s @ 0.17 hrs, Volume= 15.0 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
693.8	0.75	Row Housing
693.8		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 43S: CA3



Summary for Subcatchment 44S: CA4

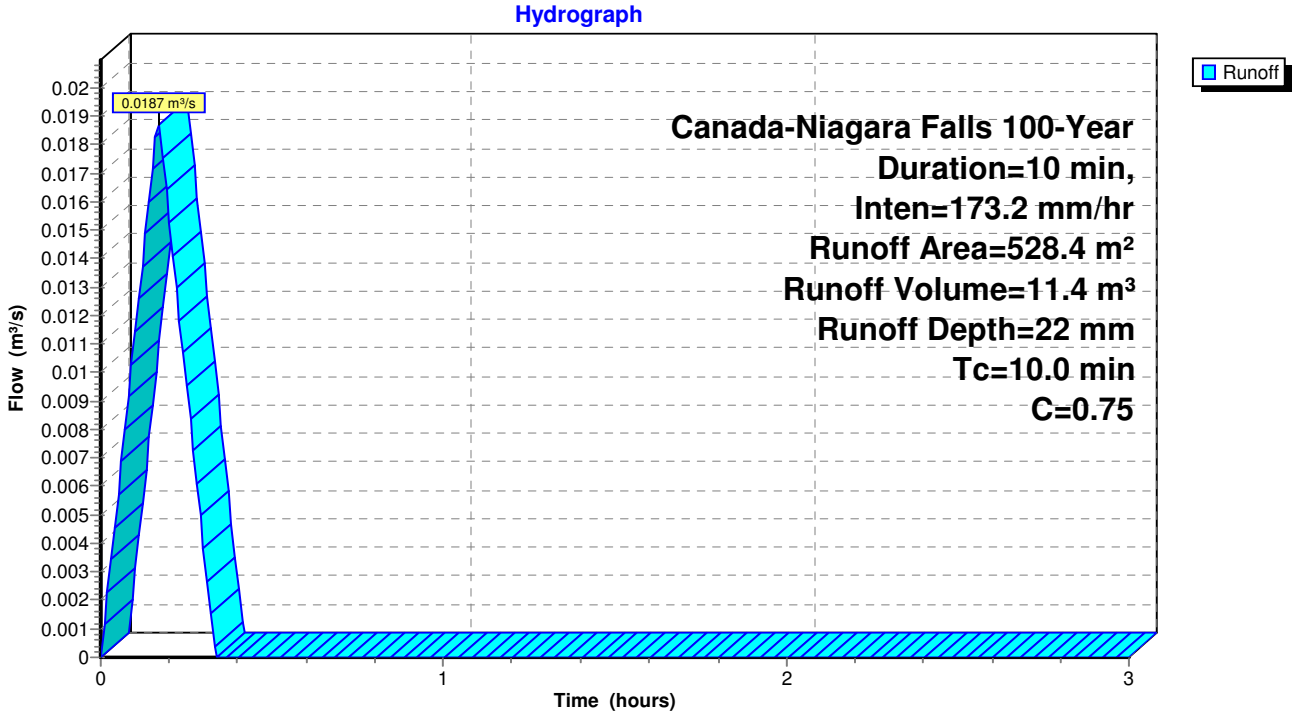
Runoff = 0.0187 m³/s @ 0.17 hrs, Volume= 11.4 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
528.4	0.75	Row Housing
528.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 44S: CA4



Summary for Subcatchment 45S: CA5

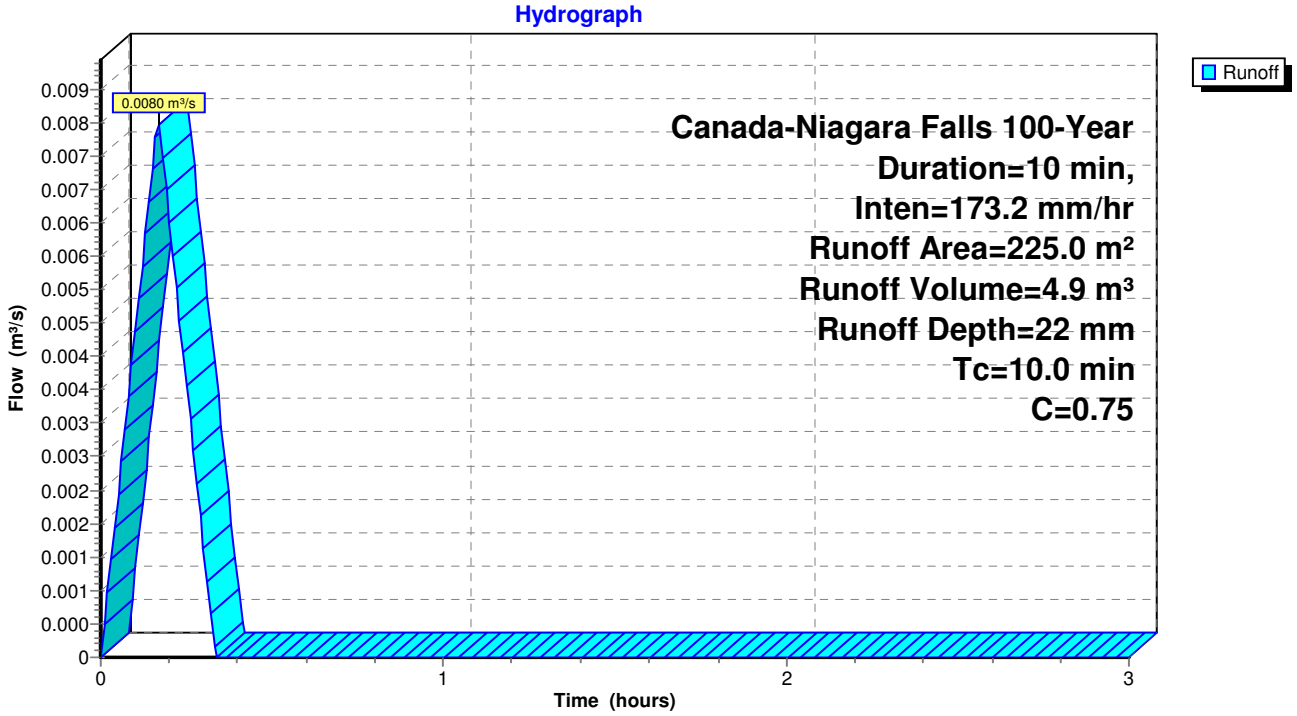
Runoff = 0.0080 m³/s @ 0.17 hrs, Volume= 4.9 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
225.0	0.75	Row Housing
225.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 45S: CA5



Summary for Subcatchment 46S: CA6

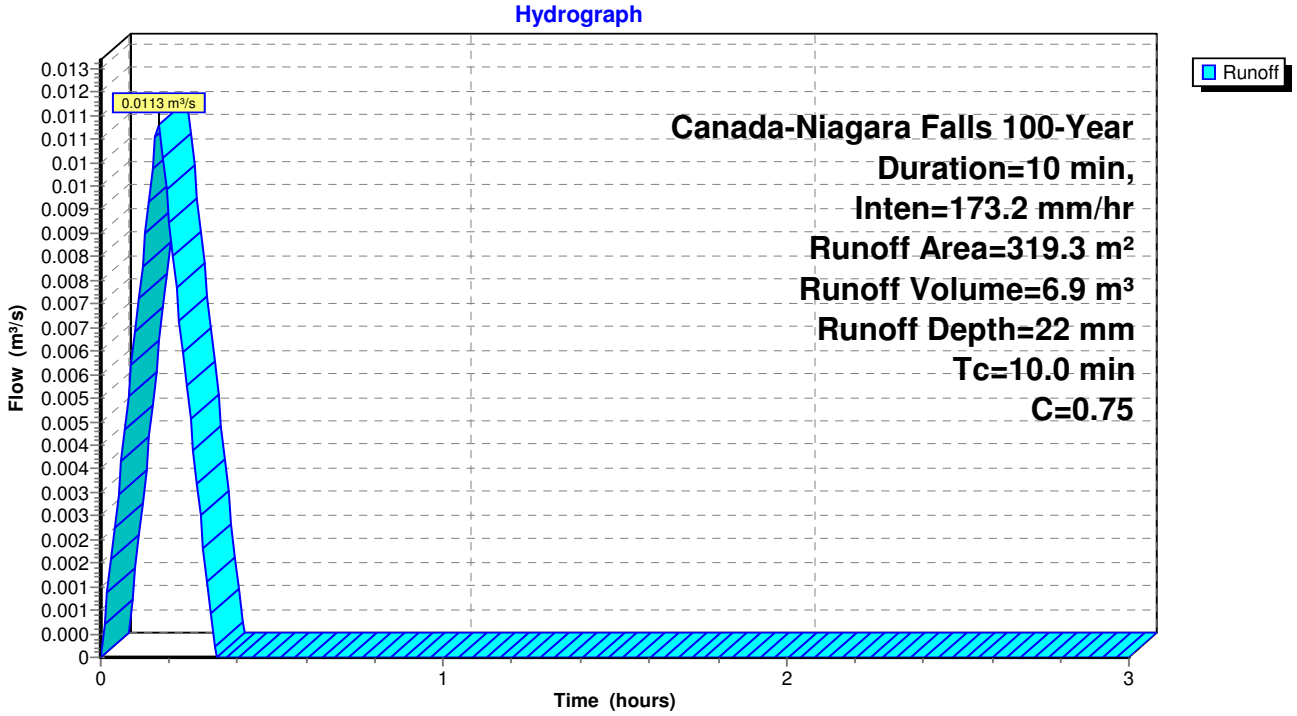
Runoff = 0.0113 m³/s @ 0.17 hrs, Volume= 6.9 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
319.3	0.75	Row Housing
319.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 46S: CA6



Summary for Subcatchment 47S: CA7

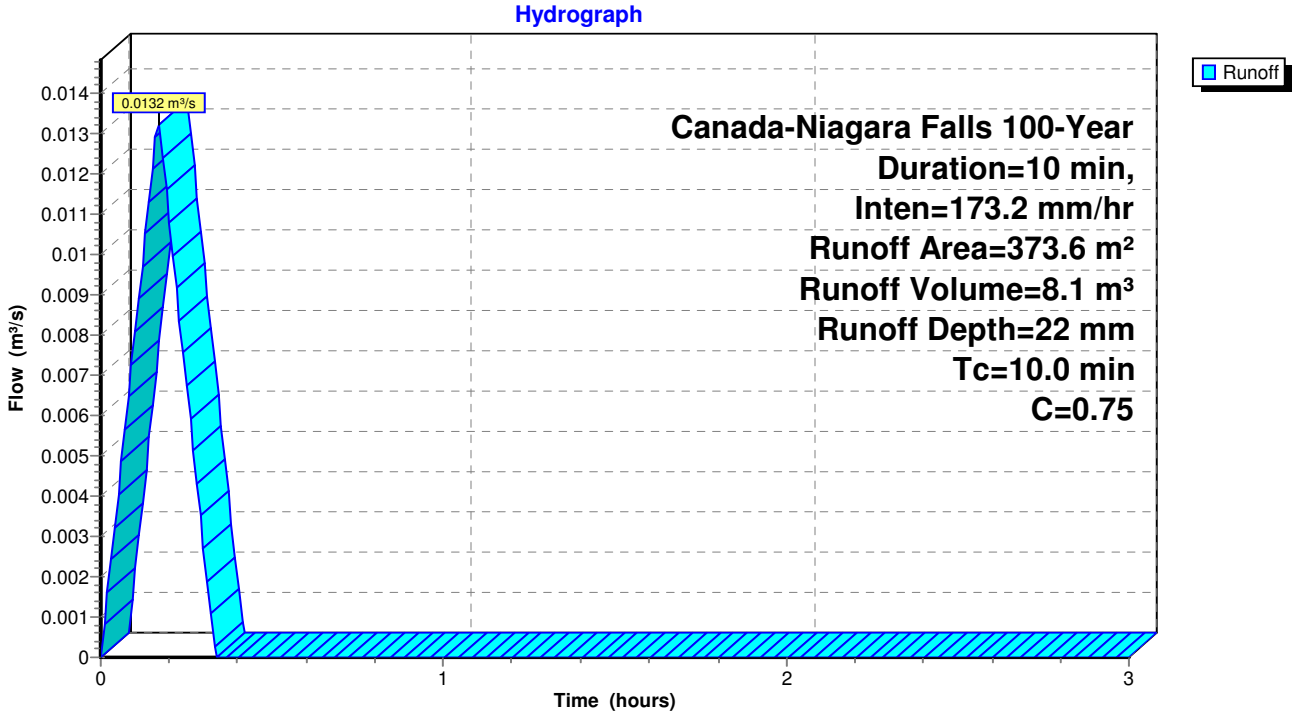
Runoff = 0.0132 m³/s @ 0.17 hrs, Volume= 8.1 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
373.6	0.75	Row Housing
373.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 47S: CA7



Summary for Subcatchment 48S: CA8

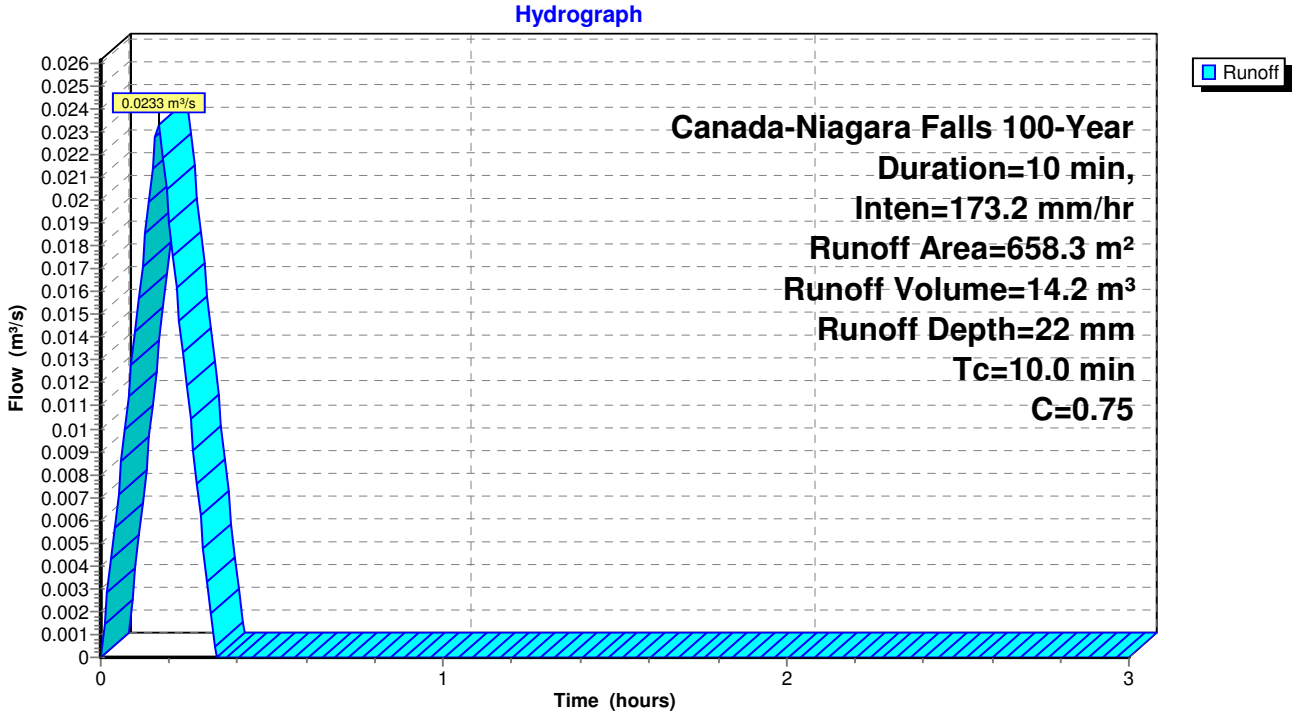
Runoff = 0.0233 m³/s @ 0.17 hrs, Volume= 14.2 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
658.3	0.75	Row Housing
658.3		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 48S: CA8



Summary for Subcatchment 49S: CA9

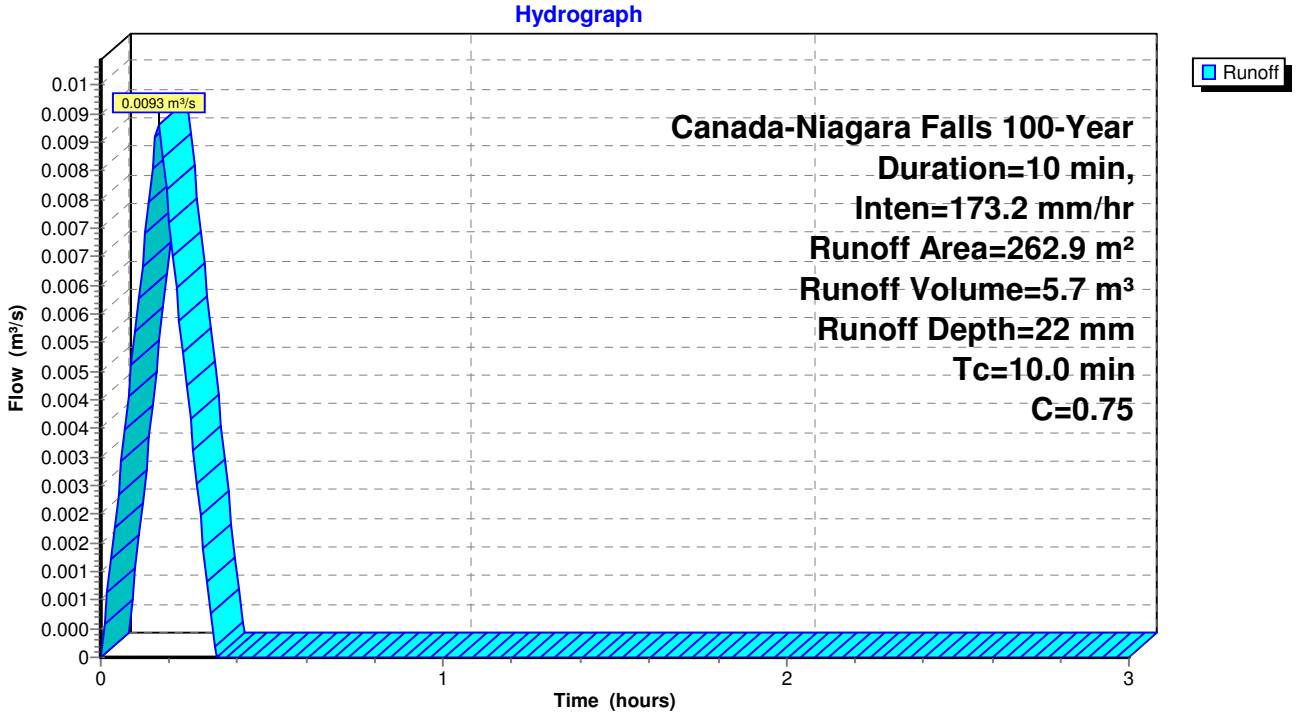
Runoff = 0.0093 m³/s @ 0.17 hrs, Volume= 5.7 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
262.9	0.75	Row Housing
262.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 49S: CA9



Summary for Subcatchment 50S: CA10

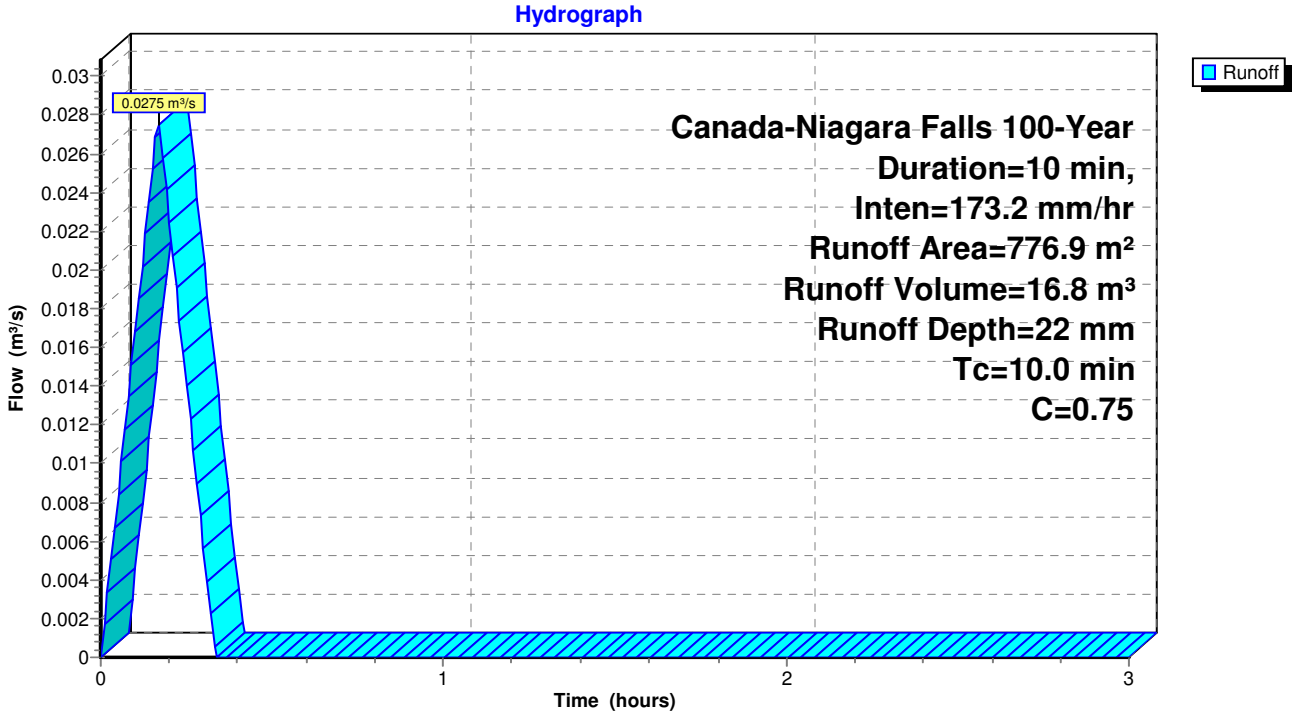
Runoff = 0.0275 m³/s @ 0.17 hrs, Volume= 16.8 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
776.9	0.75	Row Housing
776.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 50S: CA10



Summary for Subcatchment 51S: CA11

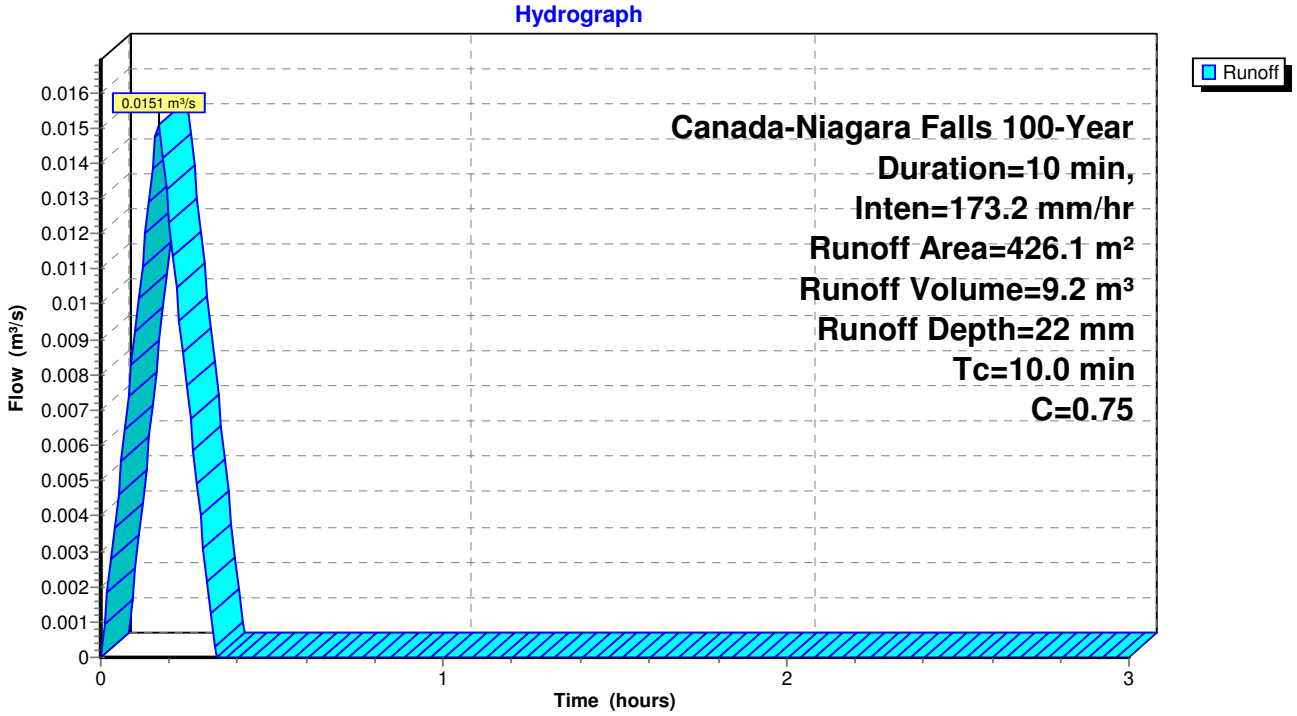
Runoff = 0.0151 m³/s @ 0.17 hrs, Volume= 9.2 m³, Depth= 22 mm
Routed to Pond 27P : Outlet

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Canada-Niagara Falls 100-Year Duration=10 min, Inten=173.2 mm/hr

Area (m²)	C	Description
426.1	0.75	Row Housing
426.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry, Direct Entry**

Subcatchment 51S: CA11



Summary for Pond 27P: Outlet

Inflow Area = 5,611.0 m², 0.00% Impervious, Inflow Depth = 22 mm for 100-Year event
Inflow = 0.1989 m³/s @ 0.17 hrs, Volume= 121.4 m³
Outflow = 0.0289 m³/s @ 0.31 hrs, Volume= 121.4 m³, Atten= 85%, Lag= 8.5 min
Primary = 0.0289 m³/s @ 0.31 hrs, Volume= 121.4 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 194.569 m @ 0.31 hrs Surf.Area= 586.9 m² Storage= 97.4 m³
Flood Elev= 194.600 m Surf.Area= 728.8 m² Storage= 117.3 m³

Plug-Flow detention time= 34.0 min calculated for 121.0 m³ (100% of inflow)
Center-of-Mass det. time= 34.2 min (44.2 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	194.400 m	12.3 m³	**Ponding Area 1 (Prismatic)** Listed below (Recalc)
#2	194.500 m	6.2 m³	**Ponding Area 2 (Prismatic)** Listed below (Recalc)
#3	194.500 m	6.2 m³	**Ponding Area 3 (Prismatic)** Listed below (Recalc)
#4	194.450 m	4.1 m³	**Ponding Area 5 (Prismatic)** Listed below (Recalc)
#5	194.400 m	18.4 m³	**Ponding Area 4 (Prismatic)** Listed below (Recalc)
#6	194.200 m	22.5 m³	**Ponding Area 6 (Prismatic)** Listed below (Recalc)
#7	192.680 m	7.1 m³	**600 mm Round Pipe Storage** L= 25.00 m S= 0.0040 m/m
#8	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#9	192.780 m	13.6 m³	**600 mm Round Pipe Storage** L= 48.00 m S= 0.0040 m/m
#10	192.800 m	7.7 m³	**1.20 mD x 1.70 mH mh** x 4
#11	192.600 m	6.8 m³	**0.60 mD x 2.40 mH Catcbasin** x 10
		118.4 m³	Total Available Storage

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	122.4	12.3	12.3

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.500	0.3	0.0	0.0
194.600	124.0	6.2	6.2

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.450	0.3	0.0	0.0
194.600	55.0	4.1	4.1

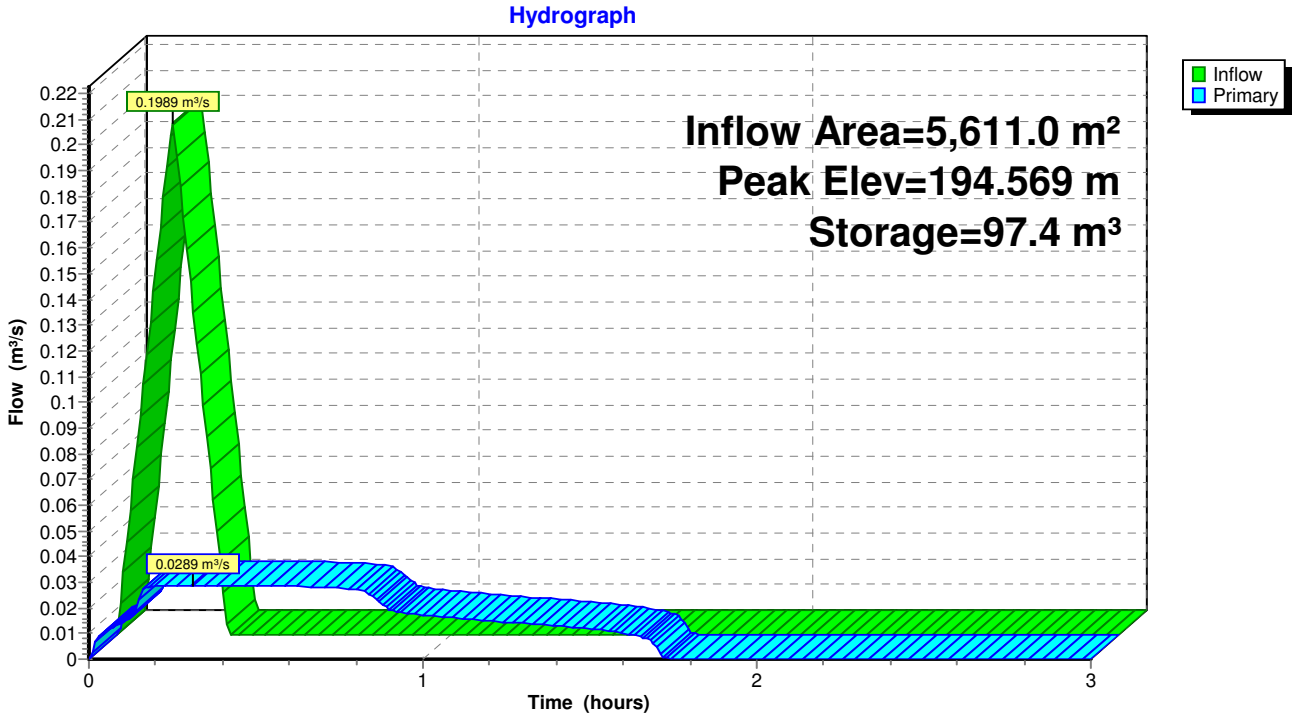
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.400	0.3	0.0	0.0
194.600	184.0	18.4	18.4

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
194.200	0.3	0.0	0.0
194.600	112.0	22.5	22.5

Device	Routing	Invert	Outlet Devices
#1	Primary	192.600 m	**100 mm Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.0289 m³/s @ 0.31 hrs HW=194.569 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0289 m³/s @ 3.68 m/s)

Pond 27P: Outlet



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  ************************************************
*      Storm Water Management Sizing Model       *
*                Hydroworks, LLC                 *
*                 Version 4.4                    *
*                                                *
*        Continuous Simulation Program           *
*              Based on SWMM 4.4H                *
*              Hydroworks, LLC                   *
*               Graham Bryant                    *
*                2003 - 2021                     *
************************************************

                Developed by

************************************************
*               Hydroworks, LLC                  *
*             Metcalf & Eddy, Inc.               *
*            University of Florida               *
*       Water Resources Engineers, Inc.          *
*      (Now Camp Dresser & McKee, Inc.)          *
*              Modified SWMM 4.4                 *
************************************************

         Distributed and Maintained by

************************************************
*                                                *
*                Hydroworks, LLC                 *
*                 888-290-7900                   *
*               www.hydroworks.com               *
*                                                *
************************************************

************************************************
*     If any problems occur executing this       *
*     model, contact Mr. Graham Bryant at        *
*     Hydroworks, LLC by phone at 888-290-7900   *
*     or by e-mail: support@hydroworks.com       *
************************************************

************************************************
*     This model is based on EPA SWMM 4.4        *
*  "Nature is full of infinite causes which      *
*   have never occurred in experience" da Vinci  *
************************************************


************************************************
* Entry made to the Rain Block                   *
* Created by the University of Florida - 1988    *
* Updated by Oregon State University, March 2000 *
************************************************
```

3151 MONTROSE ROAD, NIAGARA FALLS.

Hydroguard Simulation

```
 ########################################
 #  Precipitation Block Input Commands  #
 ########################################

Station Name.........................  St. Catherines A

Station Location.....................  Ontario

Station, ISTA........................    7287

Beginning date, IYBEG (Yr/Mo/Dy).....  1971/ 1/ 1

Ending date, IYEND (Yr/Mo/Dy).........  2005/12/31

Minimum interevent time, MIT..........     1

Number of ranked storms, NPTS.........    10

NWS format, IFORM (See text)..........     1

Print storm summary, ISUM (O-No 1-Yes)     0

Print all rainfall, IYEAR (O-No 1-Yes)     0

Save storm event data on NSCRAT(1)....     0
(IFILE =0 -Do not save, =1 -Save data)

IDECID 0 - Create interface file
       1 - Create file and analyze
       2 - Synoptic analysis..........     2

Plotting position parameter, A........  0.40

Storm event statistics, NOSTAT........  1100



KODEA (from optional group B0)........     2
 = 0, Do not include NCDC cumulative values.
 = 1, Average NCDC cumulative values.
 = 2, Use NCDC cumulative value as inst. rain.

KODEPR (from optional group B0).......     0
 Print NCDC special codes in event summary:
 = 0, only on days with events.
 = 1, on all days with codes present.
 Codes: A = accumulated value, I = incomplete value,
        M = missing value,     O = other code present
```

```
*******************************************************
*  Precipitation output created using the Rain block   *
*  Number of precipitation stations...        1        *
*******************************************************

Location Station Number
-------- --------------
       1.     7287


STATION ID ON PRECIP. DATA INPUT FILE = 7287
REQUESTED STATION ID =     7287  CHECK TO BE SURE THEY MATCH.



$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
Note, 15-min. data are being processed, but hourly
print-out, summaries, and statistics are based on
hourly totals only.  Data placed on interface file
are at correct 15-min. intervals.
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

#####################################################
# Entry made to the Runoff Block, last updated by #
# Oregon State University, and Camp, Dresser and  #
# McKee, Inc., March 2002.                        #
#####################################################
# "And wherever water goes, amoebae go along for  #
#  the ride"                    Tom Robbins       #
#####################################################



                  3151 MONTROSE ROAD, NIAGARA FALLS.

                  Copyright Hydroworks, LLC, 2022



Snowmelt parameter - ISNOW.....................          0

Number of rain gages - NRGAG...................          1

Horton infiltration equation used - INFILM.....          2
Maximum infiltration volume is limited to RMAXINF input on  subcatchment lines.
Infiltration volume regenerates during  non rainfall periods.

Quality is simulated - KWALTY..................          1

IVAP is negative.  Evaporation will be set to zero
    during time steps with rainfall.
```

```
Read evaporation data on line(s) F1 (F2) - IVAP..          1

Hour of day at start of storm - NHR.............          1

Minute of hour at start of storm - NMN..........          1

Time TZERO at start of storm (hours).............      1.017

Use Metric units for I/O - METRIC...............          1
 ===> Ft-sec units used in all internal computations

Runoff input print control...                              0

Runoff graph plot control....                              1

Runoff output print control..                              0

Print headers every 50 lines - NOHEAD (0=yes, 1=no)        0

Print land use load percentages -LANDUPR (0=no, 1=yes)     0

Limit number of groundwater convergence messages to 10000 (if simulated)

Month, day, year of start of storm is:              1/ 1/1971

Wet time step length (seconds).......                   300.

Dry time step length (seconds).......                   900.

Wet/Dry time step length (seconds)...                   450.

Simulation length is......                        20051231.0 Yr/Mo/Dy

Percent of impervious area with zero detention depth    25.0

Horton infiltration model being used
Rate for regeneration of infiltration = REGEN * DECAY
DECAY is read in for each subcatchment
REGEN = ........................................   0.01000
```

****
*   Processed Precipitation will be read from file   *
****

  ############################
  #   Data Group F1   #
  # Evaporation Rate (mm/day) #
  ############################

JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
0.00	0.00	0.00	2.54	2.54	3.81	3.81	3.81	2.54	2.54	0.00	0.00

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

Input equen umber	NAMEG: Channel ID #	Drains to NGTO:	Channel Type	Width (m)	Length (m)	Invert Slope (m/m)	L Side Slope (m/m)	R Side Slope (m/m)	Intial Depth (m)	Max Depth (m)	Mann- ings "N"	Full Flow (cms)
1	201	200	Dummy	0.0	0.0	0.0000	0.0000	0.0000	0.0	0.0	0.0000	0.00E+00

S U B C A T C H M E N T D A T A

NOTE. SEE LATER TABLE FOR OPTIONAL SUBCATCHMENT PARAMETERS

SUBCATCH- MENT NO.	CHANNEL OR INLET	WIDTH (M)	AREA (HA)	PERCENT IMPERV.	SLOPE (M/M)	RESISTANCE IMPERV.	FACTOR PERV.	DEPRES. IMPERV.	STORAGE(MM) PERV.	INFILTRATION RATE(MM/HR) MAXIMUM	INFILTRATION RATE(MM/HR) MINIMUM	DECAY RATE (1/SEC)	GAGE NO.	MAXIMUM VOLUME (MM)
1	300	200	74.91	0.56	53.00	0.0200	0.015	0.250	0.510	5.080	63.50	10.16	0.00055	1	101.60000

TOTAL NUMBER OF SUBCATCHMENTS... 1
TOTAL TRIBUTARY AREA (HECTARES). 0.56
IMPERVIOUS AREA (HECTARES)..... 0.30
PERVIOUS AREA (HECTARES)..... 0.26
TOTAL WIDTH (METERS)..... 74.91
PERCENT IMPERVIOUSNESS..... 53.00

G R O U N D W A T E R I N P U T D A T A

SUB- CATCH NUMBER	CHANNEL OR INLET	ELEVATIONS GROUND (M)	ELEVATIONS BOTTOM (M)	ELEVATIONS STAGE (M)	ELEVATIONS BC (M)	ELEVATIONS TW (M)	FLOW CONSTANTS A1 (MM/HR-M^B1)	FLOW CONSTANTS B1	FLOW CONSTANTS A2 (MM/HR-M^B2)	FLOW CONSTANTS B2	FLOW CONSTANTS A3 (MM/HR-M^2)
0	602	3.05	0.00	0.00	0.61	0.61	3.484E-04	2.600	0.000E+00	1.000	0.00E+00

G R O U N D W A T E R I N P U T D A T A (CONTINUED)

S O I L P R O P E R T I E S

SUBCAT. NO.	POROSITY	SATURATED HYDRAULIC CONDUCTIVITY (mm/hr)	WILTING POINT	FIELD CAPACITY	INITIAL MOISTURE	PERCOLATION MAX. DEEP PERCOLATION (mm/hr)	PERCOLATION PARAMETERS HCO	PERCOLATION PARAMETERS PCO	E T P A R A M E T E R S DEPTH OF ET (m)	E T P A R A M E T E R S FRACTION OF ET TO UPPER ZONE

0	.4000	127.000	.1500	.3000	.3000	5.080E-02	10.00	4.57	4.27	0.350

```
*********************************************************
*    Arrangement of Subcatchments and Channel/Pipes     *
*********************************************************
* See second subcatchment output table for connectivity *
* of subcatchment to subcatchment flows.                *
*********************************************************

   Channel
   or Pipe
      201     No Tributary Channel/Pipes
              No Tributary Subareas.....


    INLET
      200     Tributary Channel/Pipes...        201
              Tributary Subareas........        300


*********************************************************
* Hydrographs will be stored for the following   1 INLETS *
*********************************************************
          200

↑
#####################################################
#              Quality Simulation                   #
#####################################################
#      General Quality Control Data Groups          #
#####################################################

 Description                          Variable       Value
 -----------                          --------       -----

 Number of quality constituents.....    NQS.......         1

 Number of land uses................  JLAND.......         1

 Standard catchbasin volume.........  CBVOL.......      1.22 cubic meters

 Erosion is not simulated.........    IROS........         0

 DRY DAYS PRIOR TO START OF STORM... DRYDAY.......      3.00 DAYS

 DRY DAYS REQUIRED TO RECHARGE
 CATCHBASIN CONCENTRATION TO
 INITIAL VALUES..................... DRYBSN.......      5.00 DAYS

 DUST AND DIRT
 STREET SWEEPING EFFICIENCY......... REFFDD.......     0.300

 DAY OF YEAR ON WHICH STREET
```

SWEEPING BEGINS..... KLNBGN..... 120

DAY OF YEAR ON WHICH STREET
SWEEPING ENDS..... KLNEND..... 270

##
Land use data on data group J2
##

AND USE LNAME)	BUILDUP EQUATION TYPE (METHOD)	FUNCTIONAL DEPENDENCE OF BUILDUP PARAMETER(JACGUT)	LIMITING BUILDUP QUANTITY (DDLIM)	BUILDUP POWER (DDPOW)	BUILDUP COEFF. (DDFACT)	CLEANING INTERVAL IN DAYS (CLFREQ)	AVAIL. FACTOR FRACTION (AVSWP)	DAYS SINCE LAST SWEEPING (DSLCL)
Urban De	EXPONENTIAL(1)	AREA(1)	2.802E+01	0.500	67.250	30.000	0.300	30.000

↑

##
Constituent data on data group J3
##

	Total Su
Constituent units.....	mg/l
Type of units.....	0
KALC.....	2
Type of buildup calc.....	EXPONENTIAL(2)
KWASH.....	0
Type of washoff calc.....	POWER EXPONEN.(0)
KACGUT.....	1
Dependence of buildup....	AREA(1)
LINKUP.....	0
Linkage to snowmelt.....	NO SNOW LINKAGE
Buildup param 1 (QFACT1).	28.020
Buildup param 2 (QFACT2).	0.500
Buildup param 3 (QFACT3).	67.250
Buildup param 4 (QFACT4).	0.000
Buildup param 5 (QFACT5).	0.000
Washoff power (WASHPO)...	1.100
Washoff coef. (RCOEF)....	0.086
Init catchb conc (CBFACT)	100.000
Precip. conc. (CONCRN)...	0.000
Street sweep effic (REFF)	0.300
Remove fraction (REMOVE).	0.000
1st order QDECAY, 1/day..	0.000
Land use number.....	1

****
* Constant Groundwater Quality Concentration(s) *
****

Total Susp has a concentration of.. 0.0000 mg/l

****
* REMOVAL FRACTIONS FOR SELECTED CHANNEL/PIPES *
* FROM J7 LINES *
****

CHANNEL/ PIPE	CONSTITUENT Total Susp
201	0.000

****
* Subcatchment surface quality on data group L1 *
****

No.	Land Usage	Land Use No.	Total Gutter Length Km	Number of Catch-Basins	Input Loading load/ha Total Su
1	300 Urban De	1	0.15	2.00	0.0E+00
Totals (Loads in kg or other)			0.15	2.00	0.0E+00

****
* DATA GROUP M1 *
****

TOTAL NUMBER OF PRINTED GUTTERS/INLETS...NPRNT.. 1
NUMBER OF TIME STEPS BETWEEN PRINTINGS..INTERV.. 0
STARTING AND STOPPING PRINTOUT DATES..... 0 0

****
* DATA GROUP M3 *
****

CHANNEL/INLET PRINT DATA GROUPS..... -200

****
* Rainfall from Nat. Weather Serv. file *
* in units of hundredths of an inch *
****

3151 MONTROSE ROAD, NIAGARA FALLS.

Rainfall Station St. Catherines A
State/Province Ontario

Rainfall Depth Summary (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1971.	31.	0.	0.	0.	0.	0.	126.	93.	52.	60.	29.	0.	391.
1972.	0.	0.	0.	47.	65.	100.	39.	115.	63.	90.	1.	0.	521.
1973.	0.	0.	0.	103.	77.	71.	53.	29.	63.	139.	0.	0.	534.
1974.	0.	0.	0.	67.	105.	62.	50.	31.	74.	37.	110.	0.	536.
1975.	0.	0.	0.	0.	0.	94.	78.	76.	73.	56.	59.	6.	442.
1976.	0.	0.	0.	119.	136.	87.	101.	60.	72.	73.	13.	1.	662.
1977.	0.	0.	0.	94.	29.	69.	57.	150.	230.	71.	0.	1.	701.
1978.	0.	0.	0.	72.	43.	72.	43.	86.	156.	95.	0.	0.	567.
1979.	0.	0.	0.	84.	92.	33.	91.	88.	84.	129.	71.	0.	673.
1980.	0.	0.	0.	81.	39.	122.	60.	32.	79.	96.	45.	0.	554.
1981.	0.	0.	0.	91.	71.	106.	122.	61.	123.	91.	84.	0.	749.
1982.	0.	0.	0.	28.	65.	97.	36.	66.	82.	25.	143.	0.	544.
1983.	0.	0.	0.	78.	100.	65.	55.	106.	75.	122.	92.	0.	694.
1984.	0.	0.	0.	31.	113.	136.	19.	51.	144.	24.	44.	0.	562.
1985.	0.	0.	67.	32.	52.	64.	40.	94.	42.	109.	0.	1.	501.
1986.	0.	0.	0.	93.	113.	60.	85.	83.	98.	80.	43.	65.	719.
1987.	0.	2.	11.	77.	42.	80.	122.	97.	99.	71.	94.	34.	730.
1988.	0.	0.	41.	71.	42.	21.	110.	82.	70.	68.	75.	5.	585.
1989.	0.	0.	13.	63.	137.	108.	36.	45.	89.	73.	84.	0.	647.
1990.	0.	2.	38.	99.	124.	44.	68.	95.	56.	112.	96.	0.	735.
1991.	0.	0.	86.	124.	67.	31.	85.	57.	79.	64.	61.	28.	682.
1992.	0.	0.	29.	127.	56.	92.	185.	116.	77.	47.	103.	38.	869.
1993.	3.	0.	7.	83.	56.	86.	32.	61.	71.	92.	80.	38.	610.
1994.	0.	0.	44.	88.	105.	124.	48.	77.	117.	15.	0.	15.	633.
1995.	112.	23.	16.	48.	37.	60.	123.	66.	8.	137.	94.	0.	724.
1998.	0.	0.	0.	0.	51.	54.	64.	29.	9.	0.	1.	0.	207.
1999.	0.	0.	0.	79.	59.	35.	61.	58.	116.	78.	0.	0.	487.
2000.	0.	0.	0.	123.	134.	216.	51.	0.	0.	0.	10.	0.	534.
2001.	0.	0.	0.	56.	88.	45.	25.	30.	81.	129.	0.	0.	454.
2002.	0.	0.	0.	73.	104.	64.	53.	49.	52.	65.	8.	0.	468.
2003.	0.	0.	0.	10.	163.	77.	81.	64.	67.	73.	2.	0.	537.
2004.	0.	0.	0.	131.	126.	99.	115.	40.	88.	17.	0.	0.	616.
2005.	0.	0.	0.	38.	42.	78.	53.	120.	112.	0.	0.	0.	443.

Total Rainfall Depth for Simulation Period 19310. (mm)

Rainfall Intensity Analysis (mm/hr)

(mm/hr)	(#)	(%)	(mm)	(%)

2.50	21481	74.6	6454.	33.4
5.00	3585	12.4	3088.	16.0
7.50	1973	6.8	2886.	14.9
10.00	575	2.0	1233.	6.4
12.50	389	1.4	1070.	5.5
15.00	194	0.7	660.	3.4
17.50	210	0.7	846.	4.4
20.00	66	0.2	306.	1.6
22.50	92	0.3	487.	2.5
25.00	39	0.1	232.	1.2
27.50	37	0.1	246.	1.3
30.00	34	0.1	245.	1.3
32.50	29	0.1	228.	1.2
35.00	5	0.0	42.	0.2
37.50	10	0.0	90.	0.5
40.00	10	0.0	97.	0.5
42.50	12	0.0	124.	0.6
45.00	9	0.0	99.	0.5
47.50	1	0.0	12.	0.1
50.00	3	0.0	37.	0.2
>50.00	49	0.2	829.	4.3

Total # of Intensities 28803

Daily Rainfall Depth Analysis (mm)

(mm)	(#)	(%)	(mm)	(%)
2.50	1077	38.9	1247.	6.5
5.00	507	18.3	1850.	9.6
7.50	326	11.8	2006.	10.4
10.00	226	8.2	1958.	10.1
12.50	150	5.4	1672.	8.7
15.00	111	4.0	1495.	7.7
17.50	100	3.6	1620.	8.4
20.00	67	2.4	1260.	6.5
22.50	45	1.6	958.	5.0
25.00	37	1.3	881.	4.6
27.50	23	0.8	609.	3.2
30.00	20	0.7	575.	3.0
32.50	20	0.7	631.	3.3
35.00	12	0.4	405.	2.1
37.50	8	0.3	290.	1.5
40.00	9	0.3	350.	1.8
42.50	4	0.1	165.	0.9
45.00	4	0.1	173.	0.9
47.50	2	0.1	91.	0.5
50.00	4	0.1	192.	1.0
>50.00	15	0.5	882.	4.6

Total # Days with Rain 2767

****
* End of time step DO-loop in Runoff *

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

Final Date (Mo/Day/Year)   =                  1/ 1/2006
Total number of time steps =                    2056358
Final Julian Date  =                            2006001
Final time of day  =                                 2. seconds.
Final time of day  =                               0.00   hours.
Final running time =                          306816.0000   hours.
Final running time =                           12784.0000    days.

************************************************
*     Extrapolation Summary for Watersheds       *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of OVERLND Calls      *
************************************************

 Subcatch   # Steps   # Calls  Subcatch   # Steps   # Calls  Subcatch   # Steps   # Calls
 --------   -------   -------  --------   -------   -------  --------   -------   -------
      300   6150902   1558182

************************************************
*     Extrapolation Summary for Channel/Pipes    *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of GUTNR Calls        *
************************************************

Chan/Pipe   # Steps   # Calls Chan/Pipe   # Steps   # Calls Chan/Pipe   # Steps   # Calls
 --------   -------   -------  --------   -------   -------  --------   -------   -------
      201         0         0
↑
*******************************************
*       Continuity Check for Surface Water   *
*******************************************
                                                                Millimeters over
                                                  cubic meters  Total Basin
Total Precipitation (Rain plus Snow)                  108081.     19263.
Total Infiltration                                     50579.      9014.
Total Evaporation                                       5614.      1001.
Surface Runoff from Watersheds                         52519.      9360.
Total Water remaining in Surface Storage                   0.         0.
Infiltration over the Pervious Area...                 50579.     19180.
                       --------
Infiltration + Evaporation +
Surface Runoff + Snow removal +
Water remaining in Surface Storage +
Water remaining in Snow Cover.....                    108712.     19375.
Total Precipitation + Initial Storage.                108081.     19263.


The error in continuity is calculated as
*************************************
* Precipitation + Initial Snow Cover  *
*      - Infiltration -               *
*Evaporation - Snow removal -         *
*Surface Runoff from Watersheds -     *
```

```
*Water in Surface Storage -           *
*Water remaining in Snow Cover        *
*-----------------------------------*
* Precipitation + Initial Snow Cover  *
***************************************
Error.................................      -0.584 Percent


*******************************************
*       Continuity Check for Channel/Pipes   *
*******************************************
                                                          Millimeters over
                                              cubic meters  Total Basin
Initial Channel/Pipe Storage.................            0.         0.
Final Channel/Pipe Storage...................            0.         0.
Surface Runoff from Watersheds..............        52519.      9360.
Baseflow.....................................            0.
Groundwater Subsurface Inflow...............            0.         0.
Evaporation Loss from Channels..............            0.         0.
Channel/Pipe/Inlet Outflow..................        52519.      9360.
Initial Storage + Inflow.....................        52519.      9360.
Final Storage + Outflow......................        52519.      9360.
*******************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ----------------------------------   *
*  Final Storage + Outflow  + Evaporation  *
*******************************************
Error.....................................      0.000 Percent

↑
*************************************************
*     Continuity Check for Subsurface Water       *
*************************************************

                                                 Millimeters over
                                            cubic meters       Subsurface Basin

Total Infiltration                                    0.         0.
Total Upper Zone ET                                   0.         0.
Total Lower Zone ET                                   0.         0.
Total Groundwater flow                                0.         0.
Total Deep percolation                                0.         0.
Initial Subsurface Storage                         5131.       914.
Final Subsurface Storage                           5131.       914.
Upper Zone ET over Pervious Area                      0.         0.
Lower Zone ET over Pervious Area                      0.         0.


*****************************************
* Infiltration + Initial Storage - Final *
* Storage - Upper and Lower Zone ET -    *
* Groundwater Flow - Deep Percolation    *
* ------------------------------------- *
```

```
*     Infiltration + Initial Storage     *
****************************************
Error ....................................     0.000 Percent
```

SUMMARY STATISTICS FOR SUBCATCHMENTS

SUBCATCHMENT NO.	GUTTER OR INLET NO.	AREA (HA)	PERCENT IMPER.	TOTAL SIMULATED RAINFALL (MM)	PERVIOUS AREA TOTAL RUNOFF DEPTH (MM)	PERVIOUS AREA TOTAL LOSSES (MM)	PERVIOUS AREA PEAK RUNOFF RATE (CMS)	IMPERVIOUS AREA RUNOFF DEPTH (MM)	IMPERVIOUS AREA PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA RUNOFF DEPTH (MM)	TOTAL SUBCATCHMENT AREA PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA PEAK UNIT RUNOFF (MM/HR)
300	200	0.56	53.01	9262.47	82.478********	0.07217	586.297	0.162	9359.501	0.234	151.178	

*** NOTE *** IMPERVIOUS AREA STATISTICS AGGREGATE IMPERVIOUS AREAS WITH AND WITHOUT DEPRESSION STORAGE

SUMMARY STATISTICS FOR CHANNEL/PIPES

CHANNEL NUMBER	FULL FLOW (CMS)	FULL VELOCITY (M/S)	FULL DEPTH (M)	MAXIMUM COMPUTED INFLOW (CMS)	MAXIMUM COMPUTED OUTFLOW (CMS)	MAXIMUM COMPUTED DEPTH (M)	MAXIMUM COMPUTED VELOCITY (M/S)	TIME OF OCCURRENCE DAY	TIME OF OCCURRENCE HR.	LENGTH OF SURCHARGE (HOUR)	MAXIMUM SURCHARGE VOLUME (CU-M)	RATIO OF MAX. TO FULL FLOW	RATIO OF MAX. DEPTH TO FULL DEPTH
201				0.00				1/ 0/1900	0.00				
200				0.23				8/14/1972	14.25				

TOTAL NUMBER OF CHANNELS/PIPES = 2

*** NOTE *** THE MAXIMUM FLOWS AND DEPTHS ARE CALCULATED AT THE END OF THE TIME INTERVAL

```
#######################################################
#             Runoff Quality Summary Page             #
# If NDIM = 0 Units for:   loads    mass rates        #
#             METRIC = 1    lb        lb/sec          #
#             METRIC = 2    kg        kg/sec          #
# If NDIM = 1 Loads are in units of quantity          #
#             and mass rates are quantity/sec         #
# If NDIM = 2 loads are in units of concentration     #
#             times volume and mass rates have units  #
#             of concentration times volume/second    #
#######################################################


Total Su NDIM =  0
METRIC =  2
```

	Total Su
Inputs	
1. INITIAL SURFACE LOAD.....	12.
2. TOTAL SURFACE BUILDUP.....	8440.
3. INITIAL CATCHBASIN LOAD.....	0.
4. TOTAL CATCHBASIN LOAD.....	0.
5. TOTAL CATCHBASIN AND SURFACE BUILDUP (2+4).....	8440.
Remaining Loads	
6. LOAD REMAINING ON SURFACE...	6.
7. REMAINING IN CATCHBASINS....	0.
8. REMAINING IN CHANNEL/PIPES..	0.
Removals	
9. STREET SWEEPING REMOVAL.....	849.
10. NET SURFACE BUILDUP (2-9)...	7591.
11. SURFACE WASHOFF.....	7584.
12. CATCHBASIN WASHOFF.....	0.
13. TOTAL WASHOFF (11+12).....	7584.
14. LOAD FROM OTHER CONSTITUENTS	0.
15. PRECIPITATION LOAD.....	0.
15a.SUM SURFACE LOAD (13+14+15).	7584.
16. TOTAL GROUNDWATER LOAD.....	0.
16a.TOTAL I/I LOAD.....	0.
17. NET SUBCATCHMENT LOAD (15a-15b-15c-15d+16+16a)....	7584.
>>Removal in channel/pipes (17a, 17b):	
17a.REMOVE BY BMP FRACTION.....	0.
17b.REMOVE BY 1st ORDER DECAY...	0.
18. TOTAL LOAD TO INLETS.....	7585.
19. FLOW WT'D AVE.CONCENTRATION mg/l (INLET LOAD/TOTAL FLOW).....	144.
Percentages	
20. STREET SWEEPING (9/2).....	10.
21. SURFACE WASHOFF (11/2).....	90.
22. NET SURFACE WASHOFF(11/10)..	100.
23. WASHOFF/SUBCAT LOAD(11/17)..	100.
24. SURFACE WASHOFF/INLET LOAD (11/18).....	100.
25. CATCHBASIN WASHOFF/ SUBCATCHMENT LOAD (12/17)...	0.
26. CATCHBASIN WASHOFF/ INLET LOAD (12/18).....	0.
27. OTHER CONSTITUENT LOAD/ SUBCATCHMENT LOAD (14/17)...	0.
28. INSOLUBLE FRACTION/ INLET LOAD (14/18).....	0.

```
29. PRECIPITATION/
    SUBCATCHMENT LOAD (15/17)...        0.
30. PRECIPITATION/
    INLET LOAD (15/18).........         0.
31. GROUNDWATER LOAD/
    SUBCATCHMENT LOAD (16/17)...        0.
32. GROUNDWATER LOAD/
    INLET LOAD (16/18).........         0.
32a.INFILTRATION/INFLOW LOAD/
    SUBCATCHMENT LOAD (16a/17)..        0.
32b.INFILTRATION/INFLOW LOAD/
    INLET LOAD (16a/18).........        0.
32c.CH/PIPE BMP FRACTION REMOVAL/
    SUBCATCHMENT LOAD (17a/17)..        0.
32d.CH/PIPE 1st ORDER DECAY REMOVAL/
    SUBCATCHMENT LOAD (17b/17)..        0.
33. INLET LOAD SUMMATION ERROR
    (18+8+6a+17a+17b-17)/17.....        0.

CAUTION. Due to method of quality routing (Users Manual, Appendix IX)
quality routing through channel/pipes is sensitive to the time step.
Large "Inlet Load Summation Errors" may result.
These can be reduced by adjusting the time step(s).
Note: surface accumulation during dry time steps at end of simulation is
not included in totals.  Buildup is only performed at beginning of
wet steps or for street cleaning.


*******************************************************
*            TSS Particle Size Distribution           *
*******************************************************
   Diameter    %     Specific    Settling Velocity   Critical Peclet
     (um)             Gravity        (m/s)                Number


      20.    35.0      2.65         0.000267            0.070000
      35.    10.0      2.65         0.000810            0.122500
      63.     5.0      2.65         0.002547            0.220500
      88.    10.0      2.65         0.004782            0.308000
     125.    15.0      2.65         0.008981            0.437500
     200.    15.0      2.65         0.019288            0.700000
     325.     5.0      2.65         0.037472            1.137500
     750.     5.0      2.65         0.088253            2.625000

↑
*************************************************
*                                               *
*              Summary of TSS Removal           *
*                                               *
*************************************************

TSS Removal based on Lab Performance Curve

 Model      Low Q Treated  High Q Treated     Runoff Treated        TSS Removed
   #           (cms)          (cms)               (%)                  (%)
```

HG 4	0.029	0.029	97.4	85.2
HG 5	0.029	0.029	97.4	89.5
HG 6	0.029	0.029	97.4	92.1
Unavailabl	0.029	0.029	97.4	94.2
HG 8	0.029	0.029	97.4	95.7
Unavailabl	0.029	0.029	97.4	96.8
HG 10	0.029	0.029	97.4	98.1
HG 12	0.029	0.029	97.4	98.1

****
*
* Summary of Annual Flow Treatmnet & TSS Removal
*
****

HG 4

Year	Flow Vol (m3)	Flow Treated (m3)	TSS In (kg)	TSS Rem (kg)	TSS Out (kg)	TSS Byp (kg)	Flow Treated (%)	TSS Removal (%)
1971.	8914.	7943.	144.	119.	25.	7.	89.1	79.0
1972.	11457.	10118.	190.	169.	22.	12.	88.3	83.4
1973.	11184.	11130.	209.	181.	27.	1.	99.5	86.3
1974.	11430.	11083.	217.	201.	16.	6.	97.0	90.2
1975.	9692.	9312.	188.	159.	29.	5.	96.1	82.5
1976.	14423.	13825.	238.	212.	26.	8.	95.9	86.1
1977.	15473.	14789.	235.	191.	45.	9.	95.6	78.0
1978.	12314.	12217.	225.	183.	42.	2.	99.2	81.0
1979.	14765.	14197.	254.	221.	33.	8.	96.2	84.3
1980.	11882.	11640.	234.	200.	34.	4.	98.0	84.1
1981.	16407.	16196.	269.	242.	27.	2.	98.7	89.1
1982.	11544.	11465.	216.	197.	19.	1.	99.3	90.8
1983.	15222.	14834.	272.	239.	32.	8.	97.5	85.6
1984.	12265.	12265.	218.	182.	36.	0.	100.0	83.6
1985.	10705.	10678.	210.	184.	26.	0.	99.7	87.6
1986.	15595.	15464.	287.	257.	30.	3.	99.2	88.7
1987.	16135.	15709.	290.	249.	41.	4.	97.4	84.6
1988.	12968.	12630.	242.	214.	27.	2.	97.4	87.9
1989.	14211.	13740.	235.	215.	20.	5.	96.7	89.3
1990.	16096.	15920.	295.	268.	27.	4.	98.9	89.7
1991.	15085.	14807.	276.	244.	32.	4.	98.2	87.0
1992.	19174.	18924.	329.	279.	50.	4.	98.7	83.7
1993.	13059.	13000.	268.	241.	27.	1.	99.5	89.7
1994.	14050.	12972.	217.	182.	35.	14.	92.3	78.7
1995.	16207.	15646.	263.	227.	36.	12.	96.5	82.3
1998.	4234.	4232.	99.	83.	16.	0.	100.0	83.6
1999.	10324.	10139.	204.	176.	27.	2.	98.2	85.6
2000.	11836.	11681.	186.	145.	42.	2.	98.7	76.6
2001.	9397.	9397.	169.	156.	13.	0.	100.0	92.4
2002.	9813.	9781.	195.	174.	21.	1.	99.7	89.0
2003.	11162.	11056.	203.	169.	34.	1.	99.1	82.4
2004.	13389.	13383.	215.	183.	32.	0.	100.0	85.3
2005.	9706.	8896.	155.	121.	34.	8.	91.7	74.3

HG 5

Year	Flow Vol (m3)	Flow Treated (m3)	TSS In (kg)	TSS Rem (kg)	TSS Out (kg)	TSS Byp (kg)	Flow Treated (%)	TSS Removal (%)
1971.	8914.	7965.	144.	128.	16.	7.	89.4	84.9
1972.	11457.	10127.	190.	176.	14.	12.	88.4	87.0
1973.	11184.	11133.	209.	190.	19.	1.	99.5	90.5
1974.	11430.	11086.	217.	209.	8.	6.	97.0	93.8
1975.	9692.	9319.	188.	168.	19.	5.	96.2	87.5
1976.	14423.	13836.	238.	221.	16.	8.	95.9	90.0
1977.	15473.	14804.	235.	201.	34.	9.	95.7	82.1
1978.	12314.	12226.	225.	195.	30.	2.	99.3	86.2
1979.	14765.	14213.	254.	231.	23.	8.	96.3	88.3
1980.	11882.	11651.	234.	208.	26.	4.	98.0	87.6
1981.	16407.	16206.	269.	253.	16.	2.	98.8	93.2
1982.	11544.	11469.	216.	207.	9.	1.	99.3	95.4
1983.	15222.	14843.	272.	252.	20.	8.	97.5	90.1
1984.	12265.	12265.	218.	193.	25.	0.	100.0	88.6
1985.	10705.	10683.	210.	194.	16.	0.	99.8	92.4
1986.	15595.	15472.	287.	270.	17.	3.	99.2	93.3
1987.	16135.	15721.	290.	259.	30.	4.	97.4	88.3
1988.	12968.	12640.	242.	224.	18.	2.	97.5	91.7
1989.	14211.	13760.	235.	222.	14.	5.	96.8	92.1
1990.	16096.	15923.	295.	277.	18.	4.	98.9	92.7
1991.	15085.	14816.	276.	255.	21.	4.	98.2	90.9
1992.	19174.	18937.	329.	294.	35.	4.	98.8	88.2
1993.	13059.	13005.	268.	254.	14.	1.	99.6	94.4
1994.	14050.	12990.	217.	194.	24.	14.	92.5	83.7
1995.	16207.	15656.	263.	236.	27.	12.	96.6	85.7
1998.	4234.	4233.	99.	88.	12.	0.	100.0	88.3
1999.	10324.	10148.	204.	186.	18.	2.	98.3	90.1
2000.	11836.	11693.	186.	159.	27.	2.	98.8	84.5
2001.	9397.	9397.	169.	160.	8.	0.	100.0	95.1
2002.	9813.	9783.	195.	180.	15.	1.	99.7	92.3
2003.	11162.	11060.	203.	182.	21.	1.	99.1	88.8
2004.	13389.	13385.	215.	195.	20.	0.	100.0	90.7
2005.	9706.	8914.	155.	132.	23.	8.	91.8	81.1

HG 6

Year	Flow Vol (m3)	Flow Treated (m3)	TSS In (kg)	TSS Rem (kg)	TSS Out (kg)	TSS Byp (kg)	Flow Treated (%)	TSS Removal (%)
1971.	8914.	7965.	144.	129.	14.	7.	89.4	86.0
1972.	11457.	10127.	190.	183.	8.	12.	88.4	90.2
1973.	11184.	11133.	209.	196.	13.	1.	99.5	93.2
1974.	11430.	11086.	217.	212.	5.	6.	97.0	95.2
1975.	9692.	9319.	188.	174.	13.	5.	96.2	90.6
1976.	14423.	13836.	238.	227.	11.	8.	95.9	92.1

1977.	15473.	14804.	235.	212.	24.	9.	95.7	86.5
1978.	12314.	12226.	225.	206.	19.	2.	99.3	90.8
1979.	14765.	14213.	254.	237.	17.	8.	96.3	90.4
1980.	11882.	11651.	234.	217.	17.	4.	98.0	91.3
1981.	16407.	16206.	269.	260.	9.	2.	98.8	95.8
1982.	11544.	11469.	216.	210.	6.	1.	99.3	96.6
1983.	15222.	14843.	272.	259.	13.	8.	97.5	92.5
1984.	12265.	12265.	218.	204.	15.	0.	100.0	93.3
1985.	10705.	10683.	210.	202.	8.	0.	99.8	95.8
1986.	15595.	15472.	287.	276.	11.	3.	99.2	95.3
1987.	16135.	15721.	290.	270.	19.	4.	97.4	92.0
1988.	12968.	12640.	242.	230.	12.	2.	97.5	94.3
1989.	14211.	13760.	235.	224.	12.	5.	96.8	93.0
1990.	16096.	15923.	295.	283.	12.	4.	98.9	94.8
1991.	15085.	14816.	276.	260.	17.	4.	98.2	92.5
1992.	19174.	18937.	329.	301.	28.	4.	98.8	90.4
1993.	13059.	13005.	268.	258.	10.	1.	99.6	96.0
1994.	14050.	12990.	217.	198.	20.	14.	92.5	85.4
1995.	16207.	15656.	263.	242.	21.	12.	96.6	88.0
1998.	4234.	4233.	99.	91.	8.	0.	100.0	91.9
1999.	10324.	10148.	204.	192.	12.	2.	98.3	93.1
2000.	11836.	11693.	186.	166.	21.	2.	98.8	87.8
2001.	9397.	9397.	169.	165.	4.	0.	100.0	97.6
2002.	9813.	9783.	195.	187.	8.	1.	99.7	95.7
2003.	11162.	11060.	203.	185.	18.	1.	99.1	90.3
2004.	13389.	13385.	215.	201.	14.	0.	100.0	93.5
2005.	9706.	8914.	155.	137.	18.	8.	91.8	84.1

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Year	Flow Vol (m3)	Flow Treated (m3)	TSS In (kg)	TSS Rem (kg)	TSS Out (kg)	TSS Byp (kg)	Flow Treated (%)	TSS Removal (%)
1971.	8914.	7965.	144.	132.	12.	7.	89.4	87.9
1972.	11457.	10127.	190.	186.	5.	12.	88.4	91.7
1973.	11184.	11133.	209.	201.	7.	1.	99.5	95.8
1974.	11430.	11086.	217.	215.	3.	6.	97.0	96.2
1975.	9692.	9319.	188.	179.	9.	5.	96.2	92.9
1976.	14423.	13836.	238.	230.	8.	8.	95.9	93.3
1977.	15473.	14804.	235.	217.	18.	9.	95.7	88.8
1978.	12314.	12226.	225.	211.	14.	2.	99.3	93.2
1979.	14765.	14213.	254.	243.	11.	8.	96.3	92.8
1980.	11882.	11651.	234.	220.	14.	4.	98.0	92.8
1981.	16407.	16206.	269.	263.	6.	2.	98.8	97.0
1982.	11544.	11469.	216.	212.	4.	1.	99.3	97.5
1983.	15222.	14843.	272.	264.	7.	8.	97.5	94.5
1984.	12265.	12265.	218.	208.	10.	0.	100.0	95.3
1985.	10705.	10683.	210.	205.	5.	0.	99.8	97.3
1986.	15595.	15472.	287.	279.	8.	3.	99.2	96.4
1987.	16135.	15721.	290.	278.	12.	4.	97.4	94.5
1988.	12968.	12640.	242.	234.	7.	2.	97.5	96.1
1989.	14211.	13760.	235.	226.	10.	5.	96.8	93.7
1990.	16096.	15923.	295.	288.	7.	4.	98.9	96.2

1991.	15085.	14816.	276.	268.	9.	4.	98.2	95.4
1992.	19174.	18937.	329.	309.	20.	4.	98.8	92.9
1993.	13059.	13005.	268.	263.	5.	1.	99.6	97.8
1994.	14050.	12990.	217.	204.	13.	14.	92.5	88.2
1995.	16207.	15656.	263.	248.	15.	12.	96.6	90.2
1998.	4234.	4233.	99.	93.	6.	0.	100.0	93.6
1999.	10324.	10148.	204.	193.	10.	2.	98.3	93.9
2000.	11836.	11693.	186.	172.	14.	2.	98.8	91.1
2001.	9397.	9397.	169.	167.	1.	0.	100.0	99.2
2002.	9813.	9783.	195.	191.	4.	1.	99.7	97.6
2003.	11162.	11060.	203.	194.	9.	1.	99.1	94.8
2004.	13389.	13385.	215.	210.	5.	0.	100.0	97.7
2005.	9706.	8914.	155.	144.	11.	8.	91.8	88.0

HG 8

Year	Flow Vol (m3)	Flow Treated (m3)	TSS In (kg)	TSS Rem (kg)	TSS Out (kg)	TSS Byp (kg)	Flow Treated (%)	TSS Removal (%)
1971.	8914.	7965.	144.	135.	9.	7.	89.4	89.7
1972.	11457.	10127.	190.	188.	2.	12.	88.4	92.8
1973.	11184.	11133.	209.	203.	6.	1.	99.5	96.6
1974.	11430.	11086.	217.	216.	1.	6.	97.0	96.8
1975.	9692.	9319.	188.	181.	6.	5.	96.2	94.2
1976.	14423.	13836.	238.	234.	4.	8.	95.9	95.0
1977.	15473.	14804.	235.	224.	11.	9.	95.7	91.5
1978.	12314.	12226.	225.	215.	10.	2.	99.3	94.9
1979.	14765.	14213.	254.	246.	8.	8.	96.3	94.1
1980.	11882.	11651.	234.	228.	5.	4.	98.0	96.2
1981.	16407.	16206.	269.	267.	3.	2.	98.8	98.3
1982.	11544.	11469.	216.	213.	3.	1.	99.3	98.2
1983.	15222.	14843.	272.	267.	5.	8.	97.5	95.4
1984.	12265.	12265.	218.	213.	5.	0.	100.0	97.8
1985.	10705.	10683.	210.	206.	4.	0.	99.8	98.2
1986.	15595.	15472.	287.	282.	5.	3.	99.2	97.5
1987.	16135.	15721.	290.	282.	7.	4.	97.4	96.1
1988.	12968.	12640.	242.	237.	5.	2.	97.5	97.1
1989.	14211.	13760.	235.	229.	7.	5.	96.8	95.0
1990.	16096.	15923.	295.	290.	5.	4.	98.9	97.1
1991.	15085.	14816.	276.	271.	5.	4.	98.2	96.7
1992.	19174.	18937.	329.	316.	13.	4.	98.8	94.8
1993.	13059.	13005.	268.	264.	4.	1.	99.6	98.1
1994.	14050.	12990.	217.	206.	11.	14.	92.5	89.2
1995.	16207.	15656.	263.	254.	9.	12.	96.6	92.2
1998.	4234.	4233.	99.	95.	4.	0.	100.0	95.9
1999.	10324.	10148.	204.	200.	3.	2.	98.3	97.3
2000.	11836.	11693.	186.	176.	10.	2.	98.8	93.5
2001.	9397.	9397.	169.	168.	1.	0.	100.0	99.5
2002.	9813.	9783.	195.	194.	1.	1.	99.7	99.0
2003.	11162.	11060.	203.	198.	5.	1.	99.1	96.8
2004.	13389.	13385.	215.	213.	1.	0.	100.0	99.4
2005.	9706.	8914.	155.	148.	7.	8.	91.8	90.8

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Year	Flow Vol (m3)	Flow Treated (m3)	TSS In (kg)	TSS Rem (kg)	TSS Out (kg)	TSS Byp (kg)	Flow Treated (%)	TSS Removal (%)
1971.	8914.	7965.	144.	137.	6.	7.	89.4	91.3
1972.	11457.	10127.	190.	188.	2.	12.	88.4	93.1
1973.	11184.	11133.	209.	207.	2.	1.	99.5	98.6
1974.	11430.	11086.	217.	216.	1.	6.	97.0	96.9
1975.	9692.	9319.	188.	185.	3.	5.	96.2	96.1
1976.	14423.	13836.	238.	234.	3.	8.	95.9	95.1
1977.	15473.	14804.	235.	231.	4.	9.	95.7	94.4
1978.	12314.	12226.	225.	220.	5.	2.	99.3	97.2
1979.	14765.	14213.	254.	248.	6.	8.	96.3	94.7
1980.	11882.	11651.	234.	230.	4.	4.	98.0	97.0
1981.	16407.	16206.	269.	268.	2.	2.	98.8	98.5
1982.	11544.	11469.	216.	215.	1.	1.	99.3	98.9
1983.	15222.	14843.	272.	268.	4.	8.	97.5	95.8
1984.	12265.	12265.	218.	216.	2.	0.	100.0	99.1
1985.	10705.	10683.	210.	208.	2.	0.	99.8	98.7
1986.	15595.	15472.	287.	283.	4.	3.	99.2	97.8
1987.	16135.	15721.	290.	286.	4.	4.	97.4	97.3
1988.	12968.	12640.	242.	239.	3.	2.	97.5	98.0
1989.	14211.	13760.	235.	230.	5.	5.	96.8	95.5
1990.	16096.	15923.	295.	293.	2.	4.	98.9	98.1
1991.	15085.	14816.	276.	273.	3.	4.	98.2	97.4
1992.	19174.	18937.	329.	322.	7.	4.	98.8	96.6
1993.	13059.	13005.	268.	265.	3.	1.	99.6	98.6
1994.	14050.	12990.	217.	212.	5.	14.	92.5	91.6
1995.	16207.	15656.	263.	258.	5.	12.	96.6	93.8
1998.	4234.	4233.	99.	98.	1.	0.	100.0	99.0
1999.	10324.	10148.	204.	202.	2.	2.	98.3	97.9
2000.	11836.	11693.	186.	180.	6.	2.	98.8	95.5
2001.	9397.	9397.	169.	169.	0.	0.	100.0	100.0
2002.	9813.	9783.	195.	194.	1.	1.	99.7	99.4
2003.	11162.	11060.	203.	202.	1.	1.	99.1	98.8
2004.	13389.	13385.	215.	214.	0.	0.	100.0	99.8
2005.	9706.	8914.	155.	151.	4.	8.	91.8	92.5

HG 10

Year	Flow Vol (m3)	Flow Treated (m3)	TSS In (kg)	TSS Rem (kg)	TSS Out (kg)	TSS Byp (kg)	Flow Treated (%)	TSS Removal (%)
1971.	8914.	7965.	144.	144.	0.	7.	89.4	95.7
1972.	11457.	10127.	190.	190.	0.	12.	88.4	94.0
1973.	11184.	11133.	209.	209.	0.	1.	99.5	99.4
1974.	11430.	11086.	217.	217.	0.	6.	97.0	97.4
1975.	9692.	9319.	188.	188.	0.	5.	96.2	97.5
1976.	14423.	13836.	238.	238.	0.	8.	95.9	96.6
1977.	15473.	14804.	235.	235.	0.	9.	95.7	96.2

1978.	12314.	12226.	225.	225.	0.	2.	99.3	99.3
1979.	14765.	14213.	254.	254.	0.	8.	96.3	97.1
1980.	11882.	11651.	234.	234.	0.	4.	98.0	98.5
1981.	16407.	16206.	269.	269.	0.	2.	98.8	99.2
1982.	11544.	11469.	216.	216.	0.	1.	99.3	99.5
1983.	15222.	14843.	272.	272.	0.	8.	97.5	97.1
1984.	12265.	12265.	218.	218.	0.	0.	100.0	100.0
1985.	10705.	10683.	210.	210.	0.	0.	99.8	99.9
1986.	15595.	15472.	287.	287.	0.	3.	99.2	99.1
1987.	16135.	15721.	290.	290.	0.	4.	97.4	98.5
1988.	12968.	12640.	242.	242.	0.	2.	97.5	99.2
1989.	14211.	13760.	235.	235.	0.	5.	96.8	97.7
1990.	16096.	15923.	295.	295.	0.	4.	98.9	98.7
1991.	15085.	14816.	276.	276.	0.	4.	98.2	98.5
1992.	19174.	18937.	329.	329.	0.	4.	98.8	98.7
1993.	13059.	13005.	268.	268.	0.	1.	99.6	99.6
1994.	14050.	12990.	217.	217.	0.	14.	92.5	93.9
1995.	16207.	15656.	263.	263.	0.	12.	96.6	95.5
1998.	4234.	4233.	99.	99.	0.	0.	100.0	100.0
1999.	10324.	10148.	204.	204.	0.	2.	98.3	98.9
2000.	11836.	11693.	186.	186.	0.	2.	98.8	98.7
2001.	9397.	9397.	169.	169.	0.	0.	100.0	100.0
2002.	9813.	9783.	195.	195.	0.	1.	99.7	99.7
2003.	11162.	11060.	203.	203.	0.	1.	99.1	99.3
2004.	13389.	13385.	215.	215.	0.	0.	100.0	100.0
2005.	9706.	8914.	155.	155.	0.	8.	91.8	94.9

HG 12

Year	Flow Vol (m3)	Flow Treated (m3)	TSS In (kg)	TSS Rem (kg)	TSS Out (kg)	TSS Byp (kg)	Flow Treated (%)	TSS Removal (%)
1971.	8914.	7965.	144.	144.	0.	7.	89.4	95.7
1972.	11457.	10127.	190.	190.	0.	12.	88.4	94.0
1973.	11184.	11133.	209.	209.	0.	1.	99.5	99.4
1974.	11430.	11086.	217.	217.	0.	6.	97.0	97.4
1975.	9692.	9319.	188.	188.	0.	5.	96.2	97.5
1976.	14423.	13836.	238.	238.	0.	8.	95.9	96.6
1977.	15473.	14804.	235.	235.	0.	9.	95.7	96.2
1978.	12314.	12226.	225.	225.	0.	2.	99.3	99.3
1979.	14765.	14213.	254.	254.	0.	8.	96.3	97.1
1980.	11882.	11651.	234.	234.	0.	4.	98.0	98.5
1981.	16407.	16206.	269.	269.	0.	2.	98.8	99.2
1982.	11544.	11469.	216.	216.	0.	1.	99.3	99.5
1983.	15222.	14843.	272.	272.	0.	8.	97.5	97.1
1984.	12265.	12265.	218.	218.	0.	0.	100.0	100.0
1985.	10705.	10683.	210.	210.	0.	0.	99.8	99.9
1986.	15595.	15472.	287.	287.	0.	3.	99.2	99.1
1987.	16135.	15721.	290.	290.	0.	4.	97.4	98.5
1988.	12968.	12640.	242.	242.	0.	2.	97.5	99.2
1989.	14211.	13760.	235.	235.	0.	5.	96.8	97.7
1990.	16096.	15923.	295.	295.	0.	4.	98.9	98.7
1991.	15085.	14816.	276.	276.	0.	4.	98.2	98.5

1992.	19174.	18937.	329.	329.	0.	4.	98.8	98.7
1993.	13059.	13005.	268.	268.	0.	1.	99.6	99.6
1994.	14050.	12990.	217.	217.	0.	14.	92.5	93.9
1995.	16207.	15656.	263.	263.	0.	12.	96.6	95.5
1998.	4234.	4233.	99.	99.	0.	0.	100.0	100.0
1999.	10324.	10148.	204.	204.	0.	2.	98.3	98.9
2000.	11836.	11693.	186.	186.	0.	2.	98.8	98.7
2001.	9397.	9397.	169.	169.	0.	0.	100.0	100.0
2002.	9813.	9783.	195.	195.	0.	1.	99.7	99.7
2003.	11162.	11060.	203.	203.	0.	1.	99.1	99.3
2004.	13389.	13385.	215.	215.	0.	0.	100.0	100.0
2005.	9706.	8914.	155.	155.	0.	8.	91.8	94.9


```
**************************************************
*  Summary of Quantity and Quality Results at    *
*  Location        200  INFlow in cms.           *
*  Values are instantaneous at indicated time step *
**************************************************

  3151 MONTROSE ROAD, NIAGARA FALLS.
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     Date      Time         Flow   Total Su
 Mo/Da/Year  Hr:Min         cum/s  mg/l
 ----------  -------     -------  --------
Flow wtd means.....         0.000      145.
Flow wtd std devs..         0.001       61.
Maximum value......         0.234      292.
Minimum value......         0.000        0.
Total loads........        52514.     7589.
                         Cub-Met  KILOGRAM

===> Runoff simulation ended normally.

===> SWMM 4.4    simulation ended normally.
     Always check output file for possible warning messages.

**************************************************
*       SWMM 4.4    Simulation Date and Time Summary  *
**************************************************
* Starting Date... June        2, 2023              *
*          Time...         11:51: 8.751              *
*   Ending Date... June        2, 2023              *
*          Time...         11:51:15.800              *
*  Elapsed Time...               0.117 minutes.     *
*  Elapsed Time...               7.049 seconds.     *
**************************************************
```