RENFROE LAND MANAGEMENT

103 SCHNEIDER ROAD
STORMWATER MANAGEMENT REPORT

JUNE 23, 2021

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2ND SUBMISSION

PROJECT NO.: 211-01794-00
CLIENT REF:
DATE: JUNE 23, 2021

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REVISION HISTORY

FIRST ISSUE

April 6th, 2021	Draft SWM Report			
Prepared by	Reviewed by	Approved By		
KK	MH	MH		
SECOND ISSUE				
June 23rd, 2021	SWM Report			
Prepared by	Reviewed by	Approved By		
JW	MH	MH		

SIGNATURES

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June 23rd, 2021

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Team Lead, Water Resources

June 23rd, 2021

[1] Approval of this document is an administrative function indicating readiness for release and does not impart legal liability on to the Approver for any technical content contained herein. Technical accuracy and fit-for-purpose of this content is obtained through the review process. The Approver shall ensure the applicable review process has occurred prior to signing the document.

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CLIENT

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1 INTRODUCTION

1.1 SCOPE

WSP Canada Inc. was retained by Renfroe Land Management to prepare a Stormwater Management (SWM) Report for the proposed development at 103 Schneider Road in Ottawa, Ontario. This SWM report examines the potential water quality and quantity impacts of the proposed commercial development and summarizes how each will be addressed in accordance with applicable guidelines.

1.2 SITE LOCATION

The site of the proposed commercial development is located at 103 Schneider Road, Ottawa, Ontario. The subject site is bounded by Carling Avenue to the south, Leggett Drive to the north, and the Kizell Drain to the east. It is noted that portions of the property are located within the 1:100 year floodplain of the Kizell Drain.

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management plan are as follows:

- → Collect and review background information
- → Determine the site-specific stormwater management requirements to ensure that the proposals are in conformance with the applicable Provincial, Municipal and Conservation Authority stormwater management and development guidelines.
- → Evaluate various stormwater management practices that meet the applicable SWM and development requirements and recommend a preferred strategy.
- → Prepare a stormwater management report documenting the strategy along with the technical information necessary for the justification and sizing of the proposed stormwater management facilities.

1.4 DESIGN CRITERIA

Design criteria were confirmed through pre-consultation with the City of Ottawa held on December 15th, 2020 (meeting minutes include in **Appendix A**). Criteria for 103 Schneider Road are as follows:

- → **Stormwater Quantity-** control post-development flows to pre-development levels for the 2- to 100-year storm events. The existing drainage patterns for the site should be maintained. Allowable runoff coefficient (C) shall be the lesser of pre-development conditions to a maximum of 0.5.
- → **Storm Quality-** enhanced level of protection per the Mississippi Valley Conservation Authority (MVCA) is required (80% TSS Removal).
- → **Low Impact Development-** LID techniques are recommended for stormwater management and water temperature controls

2 PRE-DEVELOPMENT CONDITIONS

2.1 GENERAL

The subject site is a 2.27 ha parcel of land comprised of undeveloped lots. Under pre-development conditions the subject site consists of mostly pervious surfaces. As such, a runoff coefficient of 0.26 is estimated for existing conditions.

Existing drainage patterns for the site were determined based on topographic survey information. The pre-development catchment areas are as illustrated in Figure 1.

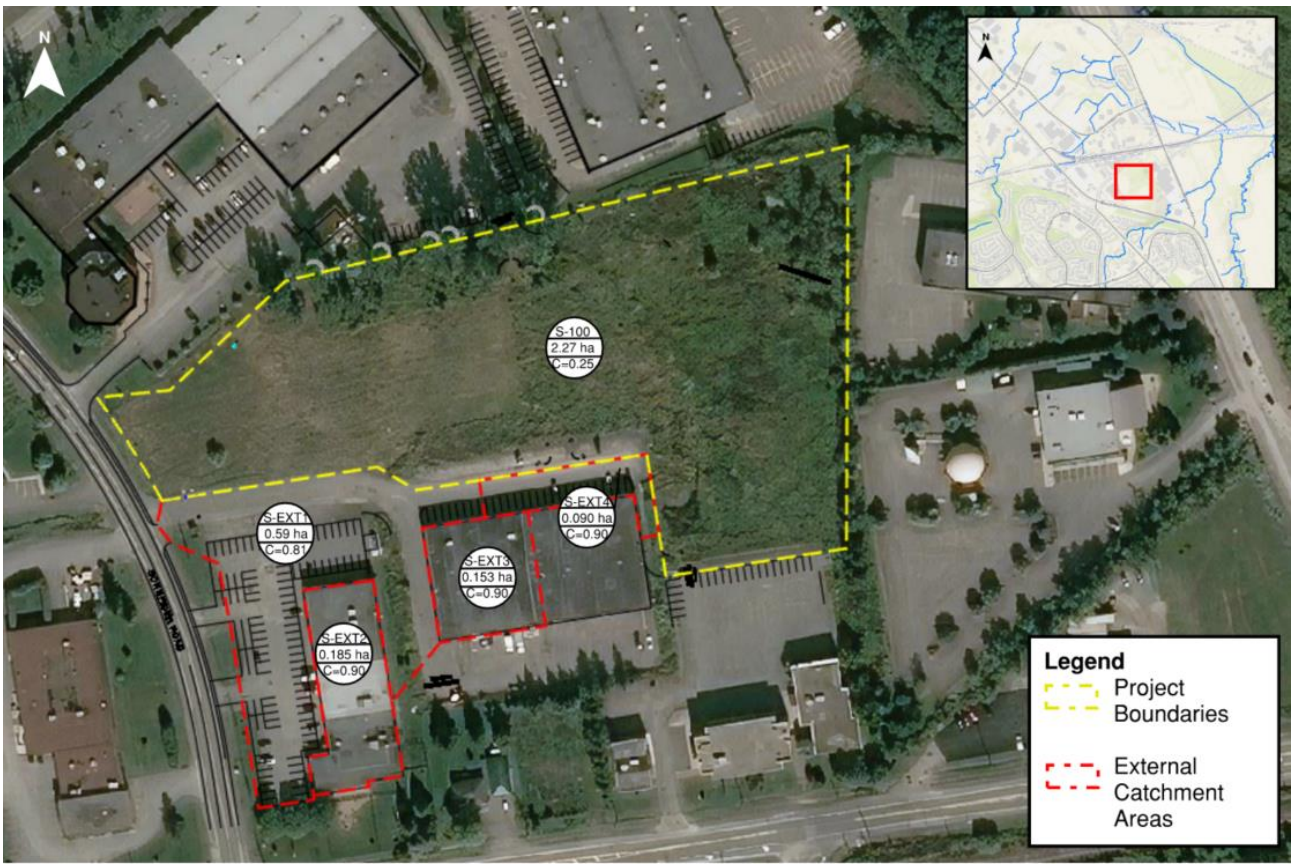


Figure 1: Existing Conditions Catchment Areas

2.2 RAINFALL INFORMATION

The rainfall intensity is calculated in accordance with Section 5.4.2 of the Ottawa Sewer Design Guidelines (October, 2012):

Where;

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

- A, B, C = regression constants for each return period (defined in section 5.4.2)
- i = rainfall intensity (mm/hour)
- Td = storm duration (minutes)

The IDF parameters/regression constants are per the Ottawa Sewer Design Guidelines (October, 2012).

2.3 ALLOWABLE FLOW RATES

As noted in section 1.4, relevant policies from the OSDG and pre-consultation meeting require the post-development discharge rate from the site match pre-development levels for the 2- to 100-year storm events.

Rational method was used to calculate the peak flow rates for the site including external catchments in the pre-development conditions summarized in Table 1. Detailed calculations are provided in **Appendix B**.

Table 1: Pre-Development Peak Flow Rate Calculations (Based on T_d= 10 minutes)

RETURN PERIOD (YEARS)	RAINFALL INTENSITY, I (MM/HOUR)	SITE PEAK FLOW RATE (M^3/SEC)	EXTERNAL AREA PEAK FLOW RATE (M^3/SEC)	TOTAL (M^3/SEC)
2	76.8	0.13	0.19	0.32
5	104.2	0.17	0.25	0.42
10	122.1	0.20	0.29	0.49
25	144.7	0.26	0.38	0.64
50	161.5	0.33	0.46	0.79
100	178.6	0.37	0.51	0.88

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The proposed Schneider Road project is a commercial development in Ottawa. Post-development condition details are shown in Figure 2 including land uses and estimated stormwater sub-catchments.

The development proposal includes 3 new buildings.

Vehicular access to the site will be provided by private roads from Schneider Road. Similar to existing conditions, the majority of the runoff will discharge to the Kizell drain. Allowances have been made for the safe conveyance of flows from the external catchments.

An estimated area breakdown for the new site layout is provided in Table 2.

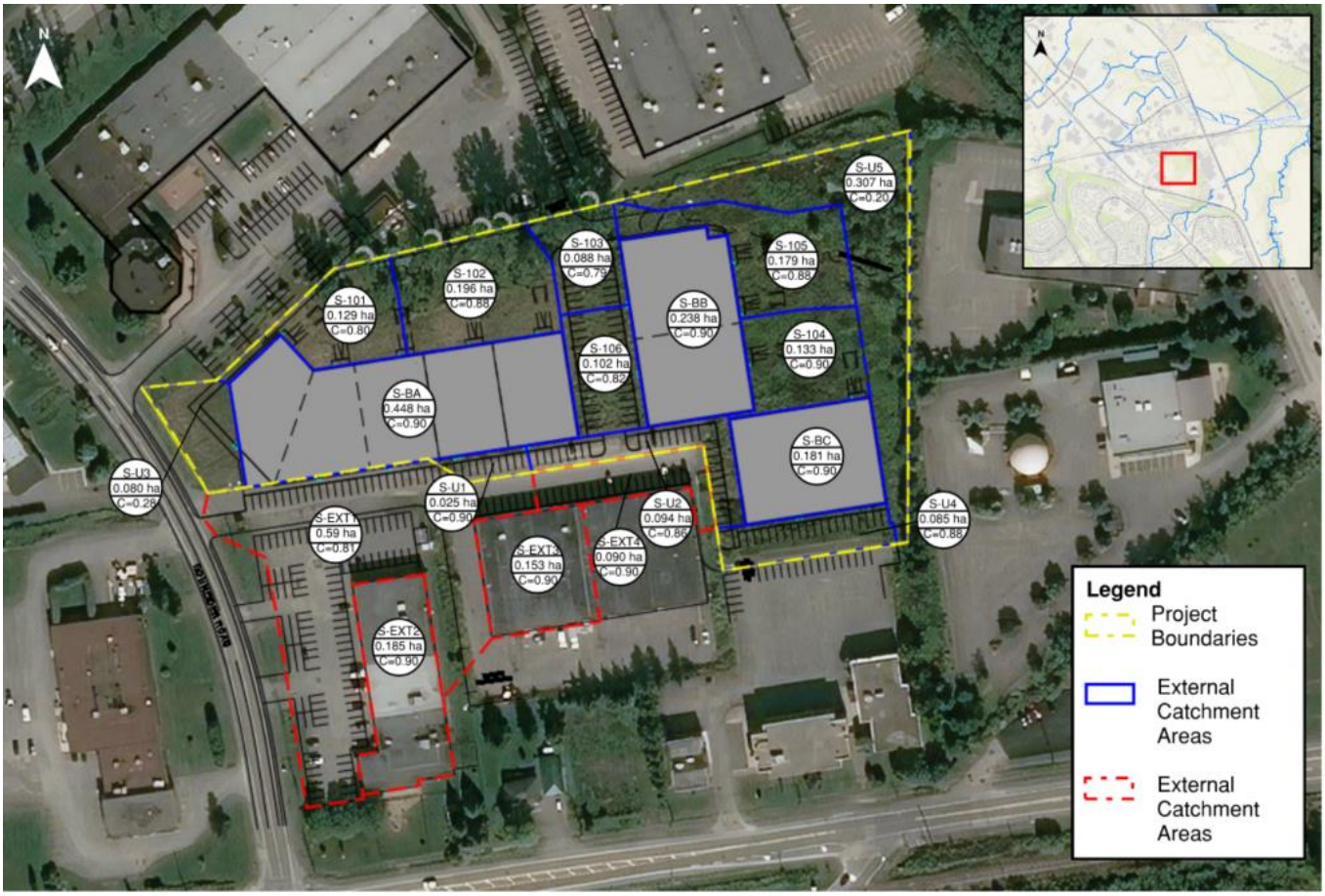


Figure 2: Proposed Conditions Catchment Areas

Table 2: Proposed Land-Use Area Breakdown

CATCHMENT ID	AREA (ha)	% COVERAGE OF PROJECT AREA	RUNOFF COEFFICIENT
External Drainage Areas			
S-EXT1	0.590		0.81
S-EXT2	0.185		0.90
S-EXT3	0.153		0.90
S-EXT4	0.090		0.90
Sub Total	1.020		0.85
Un-Controlled Drainage Areas			
S-U1	0.025	1%	0.90
S-U2	0.094	4%	0.66
S-U3	0.08	4%	0.28
S-U5	0.307	14%	0.20
Controlled Drainage Areas to Enhanced Grass Swale			
S-U4	0.085	4%	0.88
Controlled Drainage Areas			
S-101	0.129	6%	0.80
S-102	0.196	9%	0.88
S-103	0.088	4%	0.79
S-104	0.133	6%	0.90
S-105	0.179	8%	0.88
S-106	0.102	5%	0.82
S-BA	0.448	20%	0.90
S-BB	0.238	11%	0.90
S-BC	0.161	7%	0.90
TOTAL PROJECT AREA	2.27		
TOTAL (INCL. EXTERNAL DRAINAGE)	3.28		

To meet stormwater management objectives, as defined by the design criteria outlined in Section 1.4, the following components have been proposed:

- → Surface storage with inlet control devices
- → Active storage within Stormtech chambers below parking lot, with orifice flow control devices on outlets.
- → OGS unit
- → Enhanced grassed swale

The application and sizing of these proposed stormwater management facilities is outlined in the following sections.

3.2 WATER QUANTITY

As noted previously, it is required that the post-development discharge rate from the site match pre-development levels for the 2- to 100-year storm events.

Proposed features to achieve these targets include;

- → Surface storage with inlet control devices
- → Stormtech subsurface storage chambers to control runoff from roof areas, with orifice flow control devices on outlets.

HydroCAD software has been used to model the behaviour of the proposed SWM system and determine its response under various storm events. The software uses Modified Rational Method to calculate flow rates and related storage values. In addition, the software helps identify the critical duration for different components of the system. The critical storm duration (100-year) for peak discharge from the from the site occurs at 10 minutes, but the maximum storage in the subsurface chambers utilized occurs at 87 minutes. The critical storm duration for maximum storage at each storage node was also verified to ensure adequate storage volume.

Per Table 2, five uncontrolled drainage areas have been included in the model; S-U1-S-U5. Given grading constraints it has not been possible to configure the drainage system to collect runoff at these locations around the edge of the site, and runoff from these areas will therefore drain directly offsite onto surrounding lands. These uncontrolled areas are included in the analysis however, and the proposed system over-controls as required to ensure net runoff rates (including discharge from the uncontrolled areas) complies with the applicable targets.

The model was developed and tested in an iterative manner, to determine the necessary storage volumes and flow control rates from individual features. A summary of the minimum requirements follows:

- The Stormtech Chamber servicing building A (S-BA) shall provide a total minimum volume of 210 m^3. Outflow from the chamber shall be controlled with a 75 mm orifice plate.
- The Stormtech Chamber servicing Buildings B and C (S-BB, S-BC) shall provide a total minimum volume of 185 m^3. Outflow from the chamber shall be controlled with a 75 mm orifice plate.

Storage areas were defined using “pond” nodes in the model, with appropriate stage-storage relationships based on the volumes available in each area. Outflow controls from each storage node were defined using orifice control at catch basin lead pipes. Orifice sizes are shown in Table 3.

Table 3: Catchbasin Outflow Control

LOCATION	ORIFICE SIZE (mm)
CBMH105	75
CB01	75
CB02	75
CBMH107	75
CB03	75
CB04	100

A summary of the modelling results is provided in Table 4 and detailed output from the modelling is included in **Appendix B**.

Please note the it is acknowledged that modelled 2-year discharge rate from the site is slightly higher than the existing conditions discharge rate. However, the modified rational method model does not take in to account the proposed improvements to the enhanced grass swale at the eastern edge of the site that will provide additional quantity control.

Table 4: Summary of HydroCAD Modelling Results

RETURN PERIOD	PEAK DISCHARGE RATE (M^3/SEC)	TARGET RELEASE RATE (M^3/SEC)	MAX STORAGE UTILIZED IN TANK A (M^3)	MAX STORAGE UTILIZED IN TANK B (M^3)
2-Year	0.33	0.32	73	64
5-Year	0.42	0.42	103	112
10-Year	0.48	0.49	122	133
25-Year	0.55	0.64	147	160
50-Year	0.69	0.79	188	165
100-Year	0.76	0.88	210	185

To determine peak ponding depths at catchbasin (CB) locations on the surface, reference has been made to model output at each respective storage node. As noted above, ponding depths have been simulated in the model at each CB location by routing runoff from the contributing sub-catchment area to a storage node defined with a stage-storage relationship describing ponding volume available on the surface (based on proposed grading), and with outflow controlled by a stage-discharge rating curve based on a standard 600 mm square CB grate (per City of Ottawa standards).

As shown in Table 5, the model results provide maximum water depths and volume at each location, and these depths have been converted to ponding elevation for plotting maximum anticipated extents of ponding on the Civil Grading Plan.

Table 5: Summary of Surface Ponding Analysis

AREA ID	LOCATION	INVERT (M)	100-YEAR ELEV. (M)	HEAD (M)	Q_{100} (L/SEC)	MAX VOLUME (M^3)
S-102	CB01	74.23	76.14	1.88	14	60
S-103	CB02	74.12	76.12	2.00	15	14
S-105	CB03	73.91	75.75	1.84	14	52
S-106	CB04	74.22	76.79	2.57	31	6
S-104	CB05	74.03	75.73	1.70	14	33
S-101	CBMH105	74.45	76.16	1.71	14	31

3.3 WATER QUALITY

As noted previously, a single outlet location at the Kizell drain is proposed for this site and runoff will be released through orifice control at the outlet. A suitably sized oil and grit separator (OGS) unit is proposed to achieve minimum 80% TSS removal ("Enhanced" level, per development criteria) for runoff from the at-grade parking and asphalt areas.

It is assumed that runoff from the proposed rooftop areas, walkways and pervious uncontrolled areas will be free of typical sediment-generating activities and therefore runoff will leave them effectively unchanged and can be considered clean for the purposes of water quality assessment.

Note that runoff from the S-U4 catchment will be directed to the proposed enhanced grass swale at the eastern edge of the site. Enhanced grass swales are vegetated open channels that convey, treat and attenuate stormwater runoff.

Flat bottoms and vegetation in the swale decrease the velocity of the water, allowing for sedimentation, filtration through the root zone and soil, evapotranspiration, and infiltration into the underlying soil (TRCA, 2010).

The enhanced grassed swale has been designed according to the below design guidance (TRCA,2010):

- Shape: Grass swales should be designed with a trapezoidal or parabolic cross section. Trapezoidal swales will generally evolve into parabolic swales over time, so the initial trapezoidal cross section design should be checked for capacity and conveyance assuming it is a parabolic cross section. Swale length between culverts should be 5 meters or greater;
- Bottom Width: Grass swales should be designed with a bottom width between 0.75 and 3.0 meters. The design width should allow for shallow flows and adequate water quality treatment, while preventing flows from concentrating and creating gullies;
- Longitudinal Slope: Slopes should be between 0.5% and 4%. Check dams should be incorporated on slopes greater than 3%;
- Length: When used to convey and treat road runoff, the length simply parallels the road, and therefore should be equal to, or greater than the contributing roadway length;
- Flow Depth: The maximum flow depth should correspond to two-thirds the height of the vegetation. Vegetation in some grass swales may reach heights of 150 mm; therefore, a maximum flow depth of 100 mm is recommended during a 4-hour, 25 mm Chicago storm event; and
- Side Slopes: The side slopes should be as flat as possible to aid in providing pre-treatment for lateral incoming flows and to maximize the swale filtering surface. Steeper side slopes are likely to have erosion gullying from incoming lateral flows. A maximum slope of 2.5:1 (H:V) is recommended and a 4:1 slope is preferred where space permits.
- Drainage Area and Runoff Volume: The conveyance capacity should match the drainage area. Sheet flow to the grass swale is preferable. If drainage areas are greater than 2 hectares, high discharge through the swale may not allow for filtering and infiltration, and may create erosive conditions. Typical ratios of impervious drainage area to swale area range from 5:1 to 10:1.

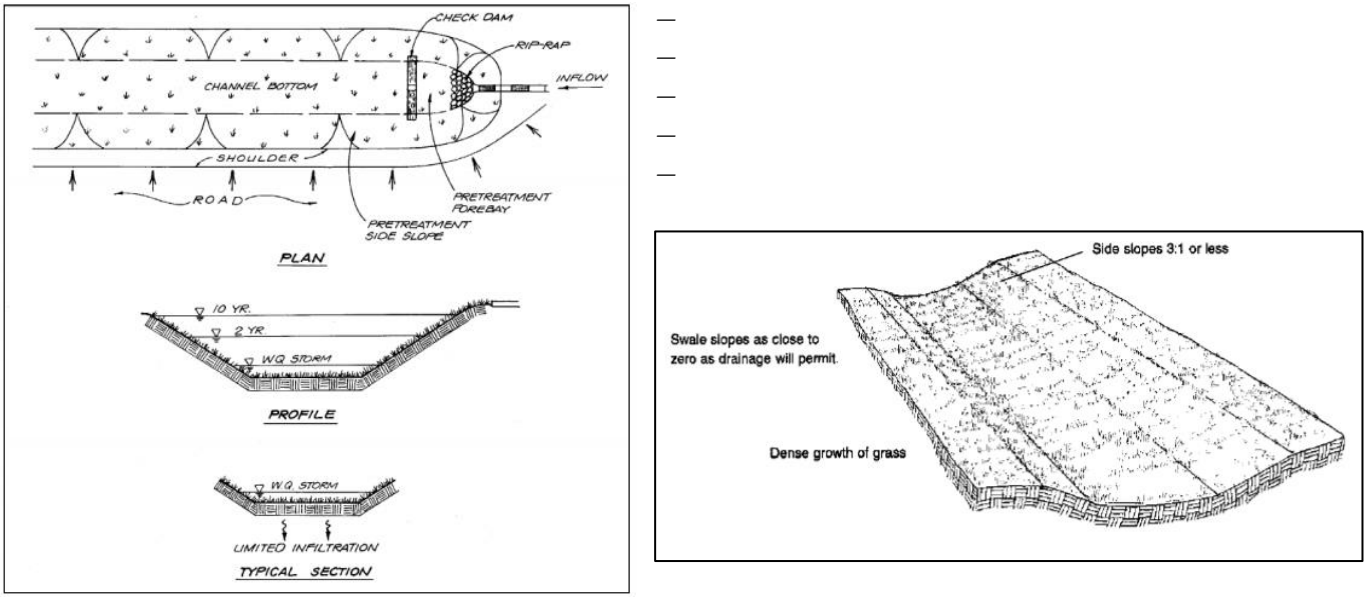


Figure 3: Plan, Profile and Section Views of Grass Swale (ref: TRCA, 2010)

3.4 FLOODPLAIN CONSIDERATIONS

Cut and fill analysis has been completed using Civil3D software, through comparison of existing and proposed 3D surfaces- as well as the 100-year floodplain elevation. To estimate the loss of floodplain storage within the site, a surface was created to represent the 100-year water elevation extending through the site (Elev. 74.89 m) and a comparison between the existing surface and the floodplain elevation was done.

The attached drawings (SK-1, SK-2) in **Appendix B** illustrate the proposed site plan design and highlight the floodline in both proposed and existing conditions. Drawings SK-3-7 (**Appendix B**) provide a series of cross-sections cut through the site to further demonstrate the difference between existing and proposed surfaces, and the proposed floodplain compensation in post-development conditions. Table 5 below summarizes the floodplain storage available in existing and proposed conditions, showing compliance with MVCA floodplain compensation requirements.

Table 6: Floodplain Storage Comparison

ORIGINAL/DESIGN SURFACE COMPARISON

Original Surface	OG	**Floodplain Storage Available**	560 m^3
Proposed Surface	100 YEAR ELEV.		630 m^3

3.5 TEMPERATURE CONSIDERATIONS

Several features have been incorporated into the SWM strategy to mitigate concerns related to temperature of runoff into the Kizell Drain.

- Provision of an enhanced grass swale as a first drainage path for runoff from the external catchments and SU-4, will help cool runoff as it passes along/through naturally vegetated media, and infiltrate flows from asphalt surfaces.
- Configuration of storage units with an open bottom to promote additional infiltration will also help address temperature control issues.
- Cooling of stormwater as it travels through the buried pipe network.

In conjunction, the above measures are considered sufficient to address MVCA requirements related to temperature of storm runoff from the site.

4 CONCLUSIONS

A stormwater management report has been prepared to support the feasibility study for the proposed 103 Schneider Road development project in the City of Ottawa. The key points are summarized below.

WATER QUALITY

An OGS unit (suitably sized Stormceptor unit, or equivalent) is proposed downstream of the orifice control for the Kizell Drain outlet to meet MOE Enhanced treatment standards (80% TSS removal). In addition, the enhanced grass swale will provide quality control for the remaining impervious areas.

WATER QUANTITY

Controlled runoff on site will be controlled on the surface using orifice plates on the catch basin lead pipes, and on the outlets of the proposed Stormtech underground storage chambers.

FLOODPLAIN COMPENSATION

Per MVCA requirements, adequate floodplain storage has been made available on the proposed site to match existing conditions.

This report has demonstrated the proposed SWM strategy will address stormwater management related impacts from this project and meet the applicable design requirements.

APPENDIX

A PRE-CONSULTATION MEETING MINUTES AND TECHNICAL COMMENTS

File No.: PC2020-0342
Date: December 22, 2020

101A, 103 and 105A Schneider Road
Pre-Consultation Meeting Minutes
Meeting Date: December 15, 2020

Attendee	Role	Organization
Lisa Stern	Planner	City of Ottawa
Josiane Gervais	Transportation PM	
Justyna Garbos	Parks	
Adam Palmer	Forestry	
Justin Armstrong	Engineering PM	
Erica Ogden	Planner	Mississippi Valley CA
David Renfroe		Applicant

Additional comments have been provided by email from Urban Design and CREO.

Comments from the Applicant:

1. Will be providing an expansion to 101 Schneider, and two industrial buildings and an office/warehouse at 103 Schneider.
2. Proposing a public park for workers adjacent to Schneider.
3. Proposing to realign access as well as modify the internal circulation. Proposing a one-way access around 101(A) Schneider to allow trucks to come back out to Schneider vs. Carling. Proposing access into the 105 Schneider site.

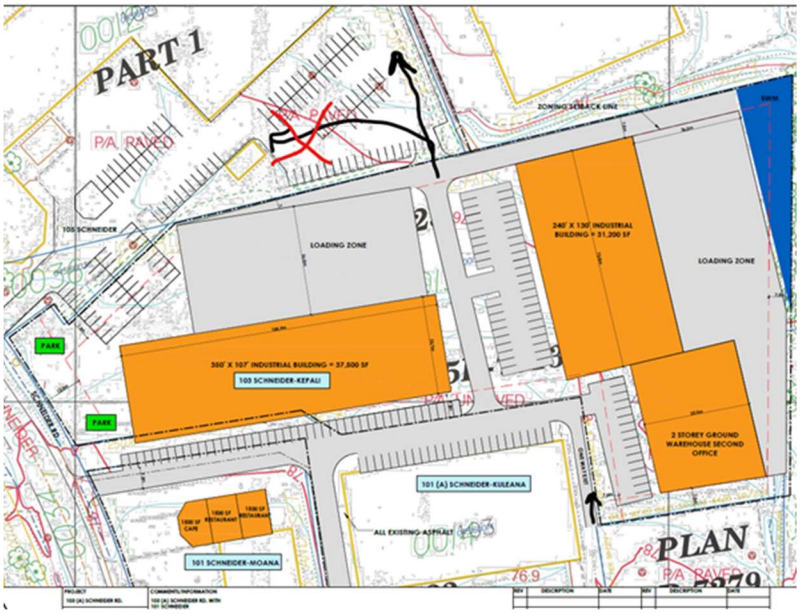
Planning Comments:

1. This is a Complex Site Plan Control Application subject to manager approval and public consultation. The application form, timeline and fees can be found here. A portion of the site is regulated by the Mississippi Valley Conservation Authority, as such CA fees are required.
2. The subject lands are designated Urban Employment Area within the City's Official Plan and are zoned General Industrial Subzone 6 (IG6), 101A Schneider Road is zoned IG6(300) which allows for additional restaurant and service uses.
3. The site will be considered one site for zoning purposes.
4. Please show the entire property on the plans.
5. A consent application is required to formalize any lot line adjustments or easements that are required for access.
6. The site is located within 300m of a rail line, as such a noise and vibration study will be required. Emphasis should be placed on outdoor amenity space and patios.
7. Please show pedestrian pathways on a site plan and ensure that there are no conflicts with vehicle movements.
8. Please provide landscape plans. Hard surfacing should be minimized, including loading areas. Parking and drive aisles should be further broken up by additional landscaping. Landscaped areas should be provided along the north and east lot lines as well as the Schneider Road frontage.
9. Cash-in-lieu of parkland and associated appraisal fee will be required as a condition of approval as per the Parkland Dedication Bylaw.
10. Please consult with the Ward Councillor prior to submission.

Engineering Comments:

1. See attached memo

Transportation Comments:

1. Follow Traffic Impact Assessment Guidelines
    a. A TIA is required. The Scoping report can be submitted directly to josiane.gervais@ottawa.ca
    b. Start this process asap. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
    c. Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)
2. ROW protection on Carling Ave between March Road and Herzberg is 44.5m even. Subject to unequal widening, the 44.5m is measured from the existing south ROW limit. The required property line should be shown on the site plan.
3. The 101 Schneider Rd property falls within 600m of the Teron/March Road BRT transit station.
4. Corner triangles as per OP Annex 1 - Road Classification and Rights-of-Way at the following locations on the final plan will be required (measure on the property line/ROW protected line; no structure above or below this triangle): Local Road to Arterial Road: 5 m x 5 m
5. Sight triangle as per Zoning by-law is 6 m x 6 m measure on the curb line.
6. Utilizing the existing access on Schneider Rd as identified on the site plan is supported.
7. Access consolidation along Schneider is encouraged.
8. Providing access through the 105 Schneider site is possible. However from a transportation perspective, consideration should be given to the impacts to the neighboring site. If vehicles turn left towards Schneider, then the driving aisle on 105 Schneider separates the parking and building, and therefore sending heavy vehicles through the site raises concern for pedestrian safety. If heavy vehicles travel northbound directly to Legget, then it's less a concern. Signage/geometric changes could be provided to address this concern.
9. 

10. Ensure that all movements can be accommodated so that a heavy vehicle may both enter and exit from the main site access off Schneider.

11. Parking lots are preferred over parking along the drive aisles. This encourage separation of pedestrians/personal vehicles from heavy vehicles.
12. A clear throat length of 15m is encouraged off Schneider.
13. Clarify that the "One Way Exit" east of the 101 (A) building is northbound within the site.
14. On site plan:
    a. The site plan should show the entire property.
    b. Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    c. Ensure pedestrian pathways are provided.
    d. Turning movement diagrams required for all accesses showing the largest vehicle to access/egress the site.
    e. Turning movement diagrams required for internal movements (loading areas, garbage).
    f. Show all curb radii measurements; ensure that all curb radii are reduced as much as possible.
    g. Show lane/aisle widths.
    h. Grey out any area that will not be impacted by this application.
15. The City recommends development on private property be in accordance with the City's Accessibility Design Standards (see attached Site Plan Checklist, which summarizes AODA requirements). As the proposed site is industrial and for general public use, AODA legislation applies.

Parks Comments:

1. Cash-in-lieu of parkland will be calculated as 2% of the gross land area of the vacant parcel at 103 Schneider Road. Thomas Quinn in Real Estate prepares land valuations, and the applicant will be required to pay the $565 (including HST) assessment fee.

Corporate Real Estate (CREO) Comments:

1. The proposed development at 101-103 Schneider Road is located within 300 m from the Renfrew Subdivision operating rail corridor. The adopted Guidelines for New Development in Proximity to Rail Operations were created by the Railway Association of Canada and the Federation of Canadian Municipalities, see: https://www.proximityissues.ca/wp-content/uploads/2017/09/2013_05_29_Guidelines_NewDevelopment_E.pdf. CREO's main objective in its adoption of these guidelines is to mitigate railway-oriented impacts such as noise, vibration, and safety hazards, to ensure that the quality of life of a building's occupants and users are not negatively affected and to the maintain the long-term integrity and viability of the rail corridor.
2. It is also recommended that a noise and vibration study should be conducted according to page 28 of the guidelines.

Urban Design Comments:

1. Please provide a landscape plan that illustrates the anticipated pedestrian circulation around the site, between the various parking zones and the buildings and with the public right of way.
2. In one location the drive aisle runs through parking while in other locations to the north there is a separate drive aisle running parallel to a parking drive aisle. Can these be consolidated and the extra land be dedicated to additional landscaping and trees?
3. We would like to better understand the restaurant building, how it is sited, its connectivity for pedestrians and vehicles and with the public right of way.

4. A Design Brief is a required submittal for all Site Plan/Re-zoning applications. Please see the Design Brief Terms of Reference (attached).

Conservation Authority:

1. The Mississippi Valley Conservation Authority (MVCA) confirms that a portion of the subject property is regulated under Ontario Regulation 153/06, *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*. Under Ontario Regulation 153/06, written permission is required from the MVCA prior to the initiation of development (which includes construction, site grading and the placement or removal of fill) within an area regulated by the Conservation Authority (regulation limit delineated in yellow on the attached regulation mapping) as well as straightening, changing, diverting or interfering in any way with the existing channel or the shoreline of a watercourse.
2. Portions of the property are located within the 1:100 year flood plain (delineated in orange on the enclosed mapping) of the Kizell Drain, which was approved by the MVCA Board of Directors in 2017. We note this updated mapping has not yet been carried forward in the City of Ottawa Zoning By-law.
3. The preliminary plan includes a stormwater management facility within the flood plain, which MVCA does not support. New development should be directed outside the flood plain.
4. The stormwater water quality requirement for the Kizell Drain is an enhanced level of protection, which requires 80% total suspended solids removal.
5. Low Impact Development techniques are recommended for stormwater management and water temperature controls should also be taken into consideration.
6. The Kizell Drain has been assessed as a part of the City Stream Watch Program. A copy of the Kizell Drain Summary Report from 2016 is available on our website https://mvc.on.ca/wp-content/uploads/2020/08/Kizell-2016.pdf
7. Digital copies of the flood plain mapping are available upon request.

Please refer to the links to "Guide to preparing studies and plans" and fees for general information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-con comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.
Please contact me at Lisa.Stern@ottawa.ca or at 613-580-2424 extension 21108 if you have any questions.

Sincerely,

Lisa Stern, RPP MCIP
Planner

MEMO

Date: December 15, 2020

To / Destinataire	Lisa Stern, Planner
From / Expéditeur	Justin Armstrong, Project Manager, Infrastructure Approvals
Subject / Objet	**Pre-Application Consultation** **101-105 Schneider Road, Ward 4** **Site Plan Control Application,**
	File No. PC2020-0342

Please note the following information regarding the engineering design submission for the above noted site:

1. The Servicing Study Guidelines for Development Applications are available at the following address: http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applications

2. Servicing and site works shall be in accordance with the following documents:

   - ⇨ Ottawa Sewer Design Guidelines (October 2012)
   - ⇨ Ottawa Design Guidelines – Water Distribution (2010)
   - ⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
   - ⇨ City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
   - ⇨ City of Ottawa Environmental Noise Control Guidelines (January, 2016)
   - ⇨ City of Ottawa Park and Pathway Development Manual (2012)
   - ⇨ City of Ottawa Accessibility Design Standards (2012)
   - ⇨ Ottawa Standard Tender Documents (latest version)
   - ⇨ Ontario Provincial Standards for Roads & Public Works (2013)

3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).

4. The Stormwater Management Criteria, for the subject site, is to be based on the following:

    i. Post-development peak flows for the site will need to be controlled to pre-development peak flows. The existing drainage patterns for the site should be maintained.

    ii. Quality control to be provided as specified by the MVCA.

    iii. Note that any stormwater runoff for the site that currently drains to Kizzel Municipal Drain must cross a portion of 302 Legget Drive before reaching the Kizzel Municipal Drain. Drainage rights across this land are not maintained if the portion of the site draining to this location is modified. If this is the case, an agreement will need to be in place with the owner of 302 Leggett in order to maintain this drainage outlet.

5. There is a 250mm diameter concrete sanitary sewer in Schneider Road. The City's Asset Management Branch will be circulated as it relates to a connection to this sewer once a detailed civil design is complete and a formal application has been made.

6. There is a 305mm diameter DI watermain in Schneider Road. A water boundary condition request should be made as it relates to a connection to this main. Water boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide Justin Armstrong the following information:

    i. Location of service

    ii. Type of development and the amount of fire flow required (as per FUS, 1999).

    iii. Average daily demand: ___ l/s.

    iv. Maximum daily demand: ___l/s.

v. Maximum hourly daily demand: ___ l/s.

7. Although most infrastructure related comments will largely be dependent on the proposed design, the following are some general comments to consider:

   i. Services should ideally be grouped in a common trench to minimize the number of road cuts.

   ii. A DMA chamber is needed for private developments serviced by a water connection 150mm in diameter or larger.

   iii. A monitoring maintenance hole should be provided for the sanitary connection – it should be located in an accessible location on private property near the property line (ie. Not in a parking area).

   iv. Sewer connections to rigid mains are to be made above the springline of the sewermain as per:

      a. Std Dwg S11 (For rigid main sewers) – lateral must be less than 50% the diameter of the sewermain,

      b. Std Dwg S11.2 (for rigid main sewers using bell end insert method) – for larger diameter laterals where manufactured inserts are not available; lateral must be less than 50% the diameter of the sewermain,

      c. Laterals greater than 50% the diameter of the sewermain require a maintenance hole.

   v. There should be no stormwater ponding in parking areas or drive aisles during the 2-year storm.

8. MOECC ECA Requirements

   It is anticipated that an MOECC Environmental Compliance Approval (ECA) for stormwater works (Private Sewage Works &/or Industrial Sewage Works) will be required, however, this will be confirmed once a detailed civil design is complete and a formal application is made.

9. Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

Should you have any questions or require additional information, please contact me directly at (613) 580-2424, x21746 or by email at Justin.Armstrong@ottawa.ca.

Conservation Partners
Partenaires de conservation

Mississippi Valley Conservation Authority | Office de protection de la nature de la vallée Mississippi | Office de protection de la nature de la vallée Rideau – Rideau Valley Conservation Authority | South Nation Conservation – Conservation de la Nation Sud

File: PMRSP-26

May 19, 2021

Lisa Stern, Planner
Development Review, West
Planning, Infrastructure and Economic Development
City of Ottawa
110 Laurier Avenue West, 4th Floor
Ottawa, ON K1P 1J1

Dear Ms. Stern:

Re: Application for Site Plan Control – D07-12-21-0044
103, 105 & 105A Schneider Road, City of Ottawa (March)

The staff of Mississippi Valley Conservation Authority (MVCA) has reviewed the above noted application for concerns related to natural heritage and natural hazards for the subject property and surrounding lands. The scope of the natural heritage review includes wetlands, watercourses and significant valleylands, while the focus of the natural hazards review includes flood plain, unstable slopes and unstable soils.

The following comments are offered for your consideration:

Summary of Proposal

The applicant has proposed three new industrial buildings to be constructed at 105A Schneider Road. Building A is proposed to be a one-storey 49,275 square foot building for light industrial uses. Building B is proposed to be a one storey 25,599 square foot building for light industrial uses. Building C is proposed to be a two storey building with light industrial uses on the main floor and office uses on the second floor. Each building will have a transport truck delivery zone.

Property Overview

The property 105A Schneider Road is approximately 2.32 ha in size and is currently vacant. The site will be developed in conjunction with the surrounding industrial buildings at 103 & 105 Schneider Road. Portions of the proposed development area are located within the 1:100 year flood plain of the Kizell Drain. Kizell Drain is located north east of the subject properties. The subject properties are located outside of the meander belt erosion hazard and approximately 30 metres from the top of bank of the channel.

Natural Heritage

The proposed development is sufficiently setback from the Kizell Drain from a natural heritage perspective. Water quality impacts are reviewed in the stormwater management section below. Low Impact Development techniques are recommended for stormwater management and water temperature controls should be

incorporated into the design as the Kizell Drain is a classified as a cool stream, as per the MVCA City Stream Watch Kizell Drain 2016 Summary Report.

Natural Hazards

As previously mentioned, the subject property is located within the 1:100 year flood plain of the Kizell Drain. New development is generally not permitted within the 1:100 year flood plain. All proposed buildings have been directed beyond the limits of the 1:100 year flood plain, however the proposed loading area and driveway north and east of Building B are located within the flood plain.

As discussed during pre-consultation, if the proposed loading area and driveway were to extend into the flood hazard, an analysis of the flood plain would be required to determine if there was an opportunity for a balanced cut and fill approach in this area to compensate for any proposed loss of flood plain storage. The application should demonstrate:

- a maximum depth of flooding of 0.3 metres over the loading area and driveway during a 1:100 year flood event,
- no loss of flood plain storage, and;
- any fill placement required within the flood plain is completed through a balanced cut and fill.

The *Grading Plan Drawing No. C03*, prepared by WSP, dated April 6, 2021 proposes to raise the existing grades for the loading area and driveway within the flood plain by over 1 metre in some locations, which would exceed the elevation of the 1:100 year flood plain.

Section 3.4 - Floodplain Considerations of the *Stormwater Management Report* prepared by WSP, dated April 06, 2021 states: "Due to development in the northeast corner of the site, 80 m^3 of floodplain volume is lost. This volume will be compensated elsewhere on the site. This will be coordinated with the developer and MVCA during detailed design."

MVCA does not recommend the application proceed without the detailed design of the balanced cut and fill. MVCA cannot support approval of an application with a loss of flood plain storage. MVCA requests that the detailed analysis of the proposed balanced cut and fill be provided at this stage. The application must demonstrate that:

1. The site alteration is confined to lands with existing ground elevations that are no more than 0.3 metres lower than the estimated 1:100 year water surface elevation of the Kizell Drain. (74.89 m G.S.C.)
2. The area of the proposed cut or fill zones will be roughly equal to one another.
3. Safe access is available. The depth of flooding does not exceed 0.3 metres.
4. The loss of flood plain storage volume within the 1:100 year flood plain which will result from the placement of fill shall be fully compensated for by an incrementally balanced cut (or excavation) to be carried out in close proximity to and concurrently with the placement of the fill. The cut and fill operation must occur on the same property.
5. Building B is appropriately flood proofed. The minimum elevation of the underside of the floor shall be 74.89 m G.S.C. No exterior openings, electrical or mechanical services (i.e. hot water tanks, furnaces, power boxes, outlets and duct work) are located below the flood proofing elevation. No basement below the flood proofing elevation.

The flood plain of the Kizell Drain is regulated by MVCA under Ontario Regulation 153/06, *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*. Under Ontario Regulation 153/06,

written permission is required from the MVCA prior to under taking the proposed development and site grading works (cut and fill balance) within the regulated area and the proposed stormwater outlet to the Kizell Drain. Permission from MVCA would follow Site Plan Control approval.

Stormwater Management

MVCA engineering staff have reviewed the following reports for impacts to water quantity and quality on the receiving watercourse:

- Renfroe Land Management 103 Schneider Road, Light Industrial Development, Ottawa, ON Servicing Report by WSP Canada Group Ltd., April 6, 2021.
- Renfroe Land Management 103 Schneider Road, Stormwater Management Report by WSP Canada Group Ltd., April 6, 2021.

Water quantity is proposed to be addressed through roof top storage and surface storage with inlet control devices. The enhanced level (80% total suspended solids removal) of water quality treatment required is proposed to be provided with an oil and grit separator.

Please see the enclosed Technical Review Memorandum for comments regarding stormwater management.

Conclusion

MVCA recommends the enclosed stormwater management comments be addressed and detailed design for the proposed balanced cut and fill, to accommodate the loading area and driveway within the flood plain of the Kizell Drain, be provided prior to proceeding with Site Plan Control approval.

Thank you for the opportunity to review and comment. Please advise us of the decision in this matter.

Please contact the undersigned with any questions that may arise.

Regards,

Erica C. Ogden, MCIP, RPP
Environmental Planner

Encl. Technical Review Memorandum – Stormwater Management

Mississippi Valley Conservation Authority

Technical Review Memorandum

May 18, 2021

File Number: PMRSP-26
To: Erica Ogden, MCIP, RPP, Environmental Planner
Prepared by: Christopher McGuire, Water Resources Engineer
Re: Site Plan Control – D07-12-21-0044 – 103, 105, 105A Schneider Road, City of Ottawa

The Mississippi Valley Conservation Authority's (MVCA) engineering team has reviewed the above noted application for concerns related to natural hazards, water quality and quantity for the subject property and surrounding lands. The following documents were reviewed in preparation of this memorandum:

- Renfroe Land Management 103 Schneider Road, Light Industrial Development, Ottawa, ON Servicing Report by WSP Canada Group Ltd., April 6, 2021.
- Renfroe Land Management 103 Schneider Road, Stormwater Management Report by WSP Canada Group Ltd., April 6, 2021.

Summary

This Site Plan Control application is to construct three new industrial buildings (total of gross floor area of 94,332 square feet) with 134 parking spaces. Access will be obtained from Schneider Road and Legget Drive. Building A is proposed to be a one-storey, 49,275 square foot building for light industrial uses. Building B is proposed to be a one storey 25,599 square foot building for light industrial uses. Building C is proposed to be a two-storey building with light industrial uses on the main floor and office uses on the second floor.

The 2.32 ha site is currently vacant and will be developed in conjunction with the surrounding industrial buildings at 103 & 105 Schneider Road. Portions of the proposed development area are located within the 1:100 year flood plain of the Kizell Drain. The Kizell Drain is located north east of the subject parcel. The subject properties are located outside of the meander belt erosion hazard and approximately 30 metres from the top of bank of the channel.

The allowable release rate was calculated to be 246 L/s. Runoff from the roof decks will be restricted with a maximum storage depth of 150 mm, although no design was provided at this time. An enhanced level of quality control (80% TSS removal) will be provided using a Stormcepter unit. No treatment is proposed for the uncontrolled drainage areas.

Sedimentation and erosion control will be provided through a combination of straw bales, bulkhead barriers, silt fencing, catch basin inserts and a temporary mud mat at the site exit. Furthermore, dewatering operations will use filter socks and dewatering traps before discharging.

Recommendations

At this time, we recommend that following comments be addressed in the next submission, prior to proceeding with Site Plan Control approval:

i) Please submit an existing drainage area plan and confirm that post development drainage patters will not have an adverse effect on external areas.

ii) The Design Criteria (1.4) note Low Impact Development will be incorporated but this has not been included in the proposal. Low Impact Development techniques are recommended for stormwater management.

iii) Water temperature controls should also be taken into consideration as design criteria.

iv) The City's Pre-Application Consultation Memo 7.v. (December 15, 2020) notes that there should be no stormwater ponding in parking areas or drive aisles during the 2-year storm. Please confirm this is achieved and show that all ponding depths are less than 0.30 m to provide safe access during the 100-year storm.

v) The Oil-Grit Separator (OGS) is located within the 100-year floodplain. Please confirm that it will work as designed up to and including the 100-year event or relocate it.

vi) Water Quality (3.3) notes that rooftop runoff is considered clean but it appears that this flow will also pass through the OGS. Please show how this flow will bypass the OGS, and outlet directly to Kizzel Drain or confirm that the OGS can handle the additional flow.

vii) Water Quality (3.3) also notes that runoff from walkways and pervious areas are considered clean. All runoff from walkways must be given an enhanced level of protection. Furthermore, runoff from asphalt areas and walkways that passes over impervious areas still require treatment.

viii) Several of the uncontrolled subcatchments are in parking and sidewalk areas that appear to bypass the OGS for quality control. Please ensure that all runoff from parking and sidewalk areas received enhanced treatment (80% TSS removal).

ix) Section 3.1 notes that surface storage with inlet control devices will be used. Please provide more details on how flows will be controlled in drainage areas S-101 to S-106.

x) Designs for the roof top storage and flow attenuation have not been completed. Please provide a detailed design with the next submission.

xi) Floodplain Considerations (3.4) notes that 80 m^3 of floodplain volume will be lost but does not explain if this is feasible at the site. Please include a detailed design that meets the MVCA's design requirements, as noted in the cover letter.

xii) The emergency overflow spillway is in the 100-year floodplain and passes over an adjacent property before reaching its outlet at the Kizzel Drain. Please provide a detailed design and confirm that this can be legally built on the adjacent property.

Thank you for providing the opportunity to review the development proposal. Should any questions arise, please contact the undersigned.

Christopher McGuire, P.Eng
Water Resources Engineer

APPENDIX

B CALCULATIONS & HYDROCAD OUTPUT

Project:	Schneider Road	No.:	
By:	JW	Date: 6/22/2021	Page: 1
Checked:	MH	Checked: 6/22/2021	

Subject: **SWM CALCULATIONS - Pre-Development Peak Flow**

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = 2.78CiA$

Where: Q = peak flow rate (litres/second)
C = runoff coefficient
i = rainfall intensity (mm/hour)
A = catchment area (hectares)

Site Area, A	22,700	m^2
Site Area, A	2.27	hectares
Runoff Coefficient, C	0.26	

Rainfall intensity calculated in accordance with City of Ottawa Sewer Design Guidelines (section 5.4.2):

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

Where: A, B, C = regression constants for each return period (defined in section 5.4.2)
i = rainfall intensity (mm/hour)
Td = storm duration (minutes) 10 minutes

Return Period (Years)	2	5	10	25	50	100*
A	733.0	998.1	1,174.2	1,402.9	1,569.6	1,735.7
B	0.810	0.814	0.816	0.819	0.820	0.820
C	6.199	6.053	6.014	6.018	6.014	6.014
T (mins)	10	10	10	10	10	10
I (mm/hr)	76.8	104.2	122.1	144.7	161.5	178.6
Runoff Coefficient C	0.26	0.26	0.26	0.26	0.26	0.26
C Multiplier (OSDG Table 5.7)	1.00	1.00	1.00	1.10	1.20	1.25
Revised Runoff Coefficient C	0.26	0.26	0.26	0.29	0.31	0.33
Q (litres/sec)	126	171	200	261	318	366
Q (m3/sec)	0.13	0.17	0.20	0.26	0.32	0.37

Project:	Schneider Road	No.:	
By:	KK	Date: 6/22/2021	Page: 1
Checked:	MH	Checked: 6/22/2021	

Subject: **SWM CALCULATIONS - Pre-Development Peak Flow - External Area**

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = 2.78CiA$

Where: Q = peak flow rate (litres/second)
C = runoff coefficient
i = rainfall intensity (mm/hour)
A = catchment area (hectares)

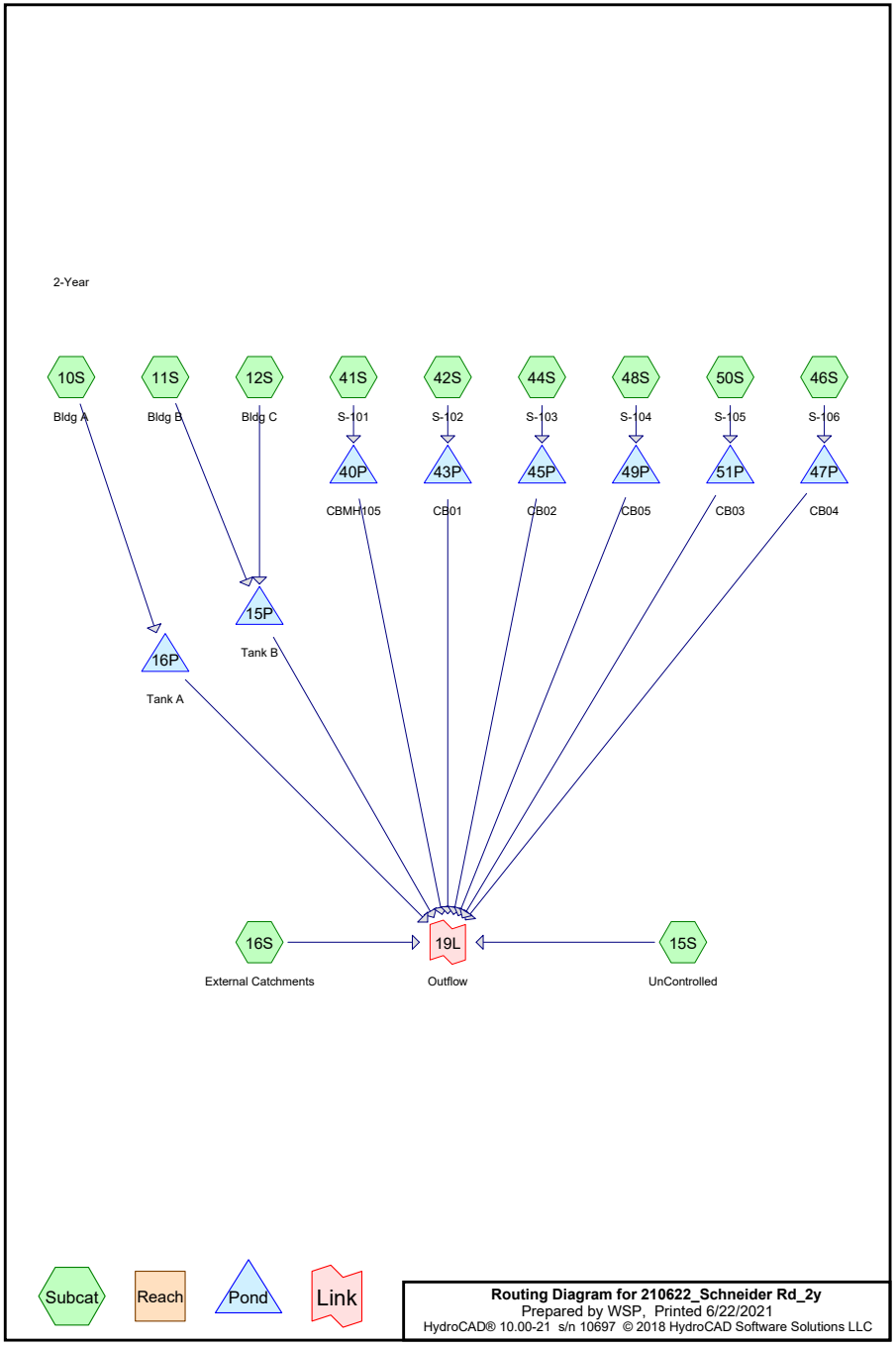
Site Area, A	10,180	m^2
Site Area, A	1.02	hectares
Runoff Coefficient, C	0.85	

Rainfall intensity calculated in accordance with City of Ottawa Sewer Design Guidelines (section 5.4.2):

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

Where: A, B, C = regression constants for each return period (defined in section 5.4.2)
i = rainfall intensity (mm/hour)
Td = storm duration (minutes) 10 minutes

Return Period (Years)	2	5	10	25	50	100*
A	733.0	998.1	1,174.2	1,402.9	1,569.6	1,735.7
B	0.810	0.814	0.816	0.819	0.820	0.820
C	6.199	6.053	6.014	6.018	6.014	6.014
T (mins)	10	10	10	10	10	10
I (mm/hr)	76.8	104.2	122.1	144.7	161.5	178.6
Runoff Coefficient C	0.85	0.85	0.85	0.85	0.85	0.85
C Multiplier (OSDG Table 5.7)	1.00	1.00	1.00	1.10	1.20	1.25
Revised Runoff Coefficient C	0.85	0.85	0.85	0.94	1.00	1.00
Q (litres/sec)	185	251	294	383	457	505
Q (m3/sec)	0.18	0.25	0.29	0.38	0.46	0.51



210622_Schneider Rd_2y

Prepared by WSP

Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
8,471.0	0.90	(10S, 11S, 12S)
1,290.0	0.80	S-101 (41S)
1,960.0	0.88	S-102 (42S)
880.0	0.79	S-103 (44S)
1,330.0	0.90	S-104 (48S)
1,790.0	0.88	S-105 (50S)
1,020.0	0.82	S-106 (46S)
5,900.0	0.81	S-EXT1 (16S)
1,850.0	0.90	S-EXT2 (16S)
1,530.0	0.90	S-EXT3 (16S)
900.0	0.90	S-EXT4 (16S)
250.0	0.90	S-U1 (15S)
940.0	0.86	S-U2 (15S)
800.0	0.28	S-U3 (15S)
850.0	0.88	S-U4 (15S)
3,070.0	0.20	S-U5 (15S)
32,831.0	**0.79**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-meters)	Soil Group	Subcatchment Numbers
0.0	HSG A	
0.0	HSG B	
0.0	HSG C	
0.0	HSG D	
32,831.0	Other	10S, 11S, 12S, 15S, 16S, 41S, 42S, 44S, 46S, 48S, 50S
32,831.0		**TOTAL AREA**

Ground Covers (selected 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	Subca Numbe
0.0	0.0	0.0	0.0	8,471.0	8,471.0		
0.0	0.0	0.0	0.0	1,290.0	1,290.0	S-101	
0.0	0.0	0.0	0.0	1,960.0	1,960.0	S-102	
0.0	0.0	0.0	0.0	880.0	880.0	S-103	
0.0	0.0	0.0	0.0	1,330.0	1,330.0	S-104	
0.0	0.0	0.0	0.0	1,790.0	1,790.0	S-105	
0.0	0.0	0.0	0.0	1,020.0	1,020.0	S-106	
0.0	0.0	0.0	0.0	5,900.0	5,900.0	S-EXT1	
0.0	0.0	0.0	0.0	1,850.0	1,850.0	S-EXT2	
0.0	0.0	0.0	0.0	1,530.0	1,530.0	S-EXT3	
0.0	0.0	0.0	0.0	900.0	900.0	S-EXT4	
0.0	0.0	0.0	0.0	250.0	250.0	S-U1	
0.0	0.0	0.0	0.0	940.0	940.0	S-U2	
0.0	0.0	0.0	0.0	800.0	800.0	S-U3	
0.0	0.0	0.0	0.0	850.0	850.0	S-U4	
0.0	0.0	0.0	0.0	3,070.0	3,070.0	S-U5	
0.0	**0.0**	**0.0**	**0.0**	**32,831.0**	**32,831.0**	**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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment10S: Bldg A Runoff Area=0.4481 ha 0.00% Impervious Runoff Depth=12 mm
Tc=10.0 min C=0.90 Runoff=0.0845 m³/s 51.6 m³

Subcatchment11S: Bldg B Runoff Area=0.2380 ha 0.00% Impervious Runoff Depth=12 mm
Tc=10.0 min C=0.90 Runoff=0.0449 m³/s 27.4 m³

Subcatchment12S: Bldg C Runoff Area=0.1610 ha 0.00% Impervious Runoff Depth=12 mm
Tc=10.0 min C=0.90 Runoff=0.0304 m³/s 18.5 m³

Subcatchment15S: UnControlled Runoff Area=0.5910 ha 0.00% Impervious Runoff Depth=6 mm
Tc=10.0 min C=0.44 Runoff=0.0545 m³/s 33.3 m³

Subcatchment16S: External Runoff Area=1.0180 ha 0.00% Impervious Runoff Depth=11 mm
Tc=10.0 min C=0.85 Runoff=0.1814 m³/s 110.7 m³

Subcatchment41S: S-101 Runoff Area=0.1290 ha 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.80 Runoff=0.0216 m³/s 13.2 m³

Subcatchment42S: S-102 Runoff Area=0.1960 ha 0.00% Impervious Runoff Depth=11 mm
Tc=10.0 min C=0.88 Runoff=0.0362 m³/s 22.1 m³

Subcatchment44S: S-103 Runoff Area=0.0880 ha 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.79 Runoff=0.0146 m³/s 8.9 m³

Subcatchment46S: S-106 Runoff Area=0.1020 ha 0.00% Impervious Runoff Depth=10 mm
Tc=10.0 min C=0.82 Runoff=0.0175 m³/s 10.7 m³

Subcatchment48S: S-104 Runoff Area=0.1330 ha 0.00% Impervious Runoff Depth=12 mm
Tc=10.0 min C=0.90 Runoff=0.0251 m³/s 15.3 m³

Subcatchment50S: S-105 Runoff Area=0.1790 ha 0.00% Impervious Runoff Depth=11 mm
Tc=10.0 min C=0.88 Runoff=0.0330 m³/s 20.2 m³

Pond 15P: Tank B Peak Elev=74.304 m Storage=41.0 m³ Inflow=0.0753 m³/s 45.9 m³
Outflow=0.0072 m³/s 42.1 m³

Pond 16P: Tank A Peak Elev=74.519 m Storage=46.3 m³ Inflow=0.0845 m³/s 51.6 m³
Outflow=0.0077 m³/s 47.0 m³

Pond 40P: CBMH105 Peak Elev=76.005 m Storage=2.8 m³ Inflow=0.0216 m³/s 13.2 m³
Outflow=0.0128 m³/s 13.1 m³

Pond 43P: CB01 Peak Elev=76.023 m Storage=9.3 m³ Inflow=0.0362 m³/s 22.1 m³
Outflow=0.0136 m³/s 21.9 m³

Pond 45P: CB02 Peak Elev=75.777 m Storage=0.7 m³ Inflow=0.0146 m³/s 8.9 m³
Outflow=0.0136 m³/s 8.8 m³

Pond 47P: CB04 Peak Elev=75.316 m Storage=0.4 m³ Inflow=0.0175 m³/s 10.7 m³
Outflow=0.0171 m³/s 10.6 m³

Pond 49P: CB05 Peak Elev=75.578 m Storage=4.2 m³ Inflow=0.0251 m³/s 15.3 m³
Outflow=0.0131 m³/s 15.2 m³

Pond 51P: CB03 Peak Elev=75.560 m Storage=8.1 m³ Inflow=0.0330 m³/s 20.2 m³
Outflow=0.0136 m³/s 19.7 m³

Link 19L: Outflow Inflow=0.3291 m³/s 322.4 m³
Primary=0.3291 m³/s 322.4 m³

Total Runoff Area = 32,831.0 m² Runoff Volume = 331.9 m³ Average Runoff Depth = 10 mm
100.00% Pervious = 32,831.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 10S: Bldg A

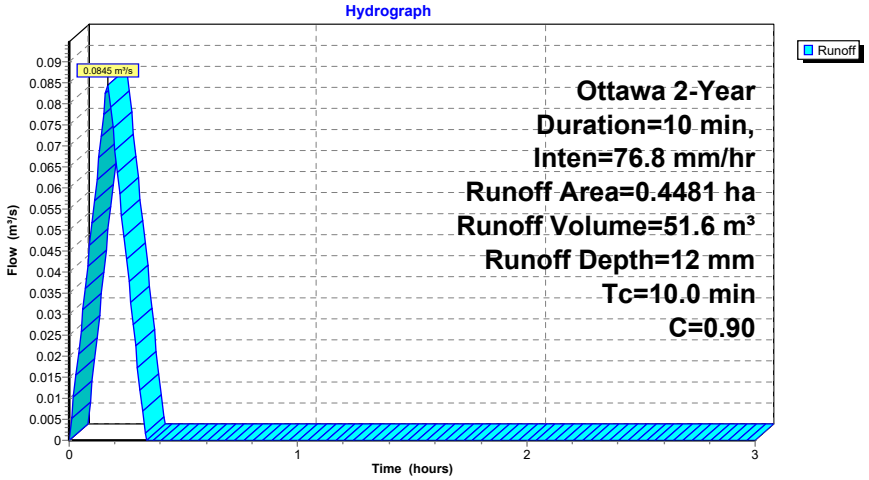
Runoff = 0.0845 m³/s @ 0.17 hrs, Volume= 51.6 m³, Depth= 12 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.4481	0.90	
0.4481		100.00% Pervious Area

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

Subcatchment 10S: Bldg A



Summary for Subcatchment 11S: Bldg B

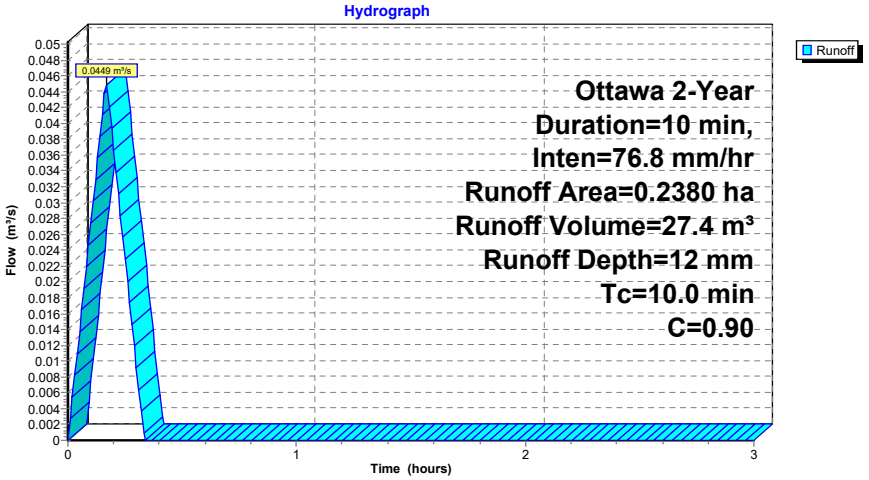
Runoff = 0.0449 m³/s @ 0.17 hrs, Volume= 27.4 m³, Depth= 12 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.2380	0.90	
0.2380		100.00% Pervious Area

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

Subcatchment 11S: Bldg B



Summary for Subcatchment 12S: Bldg C

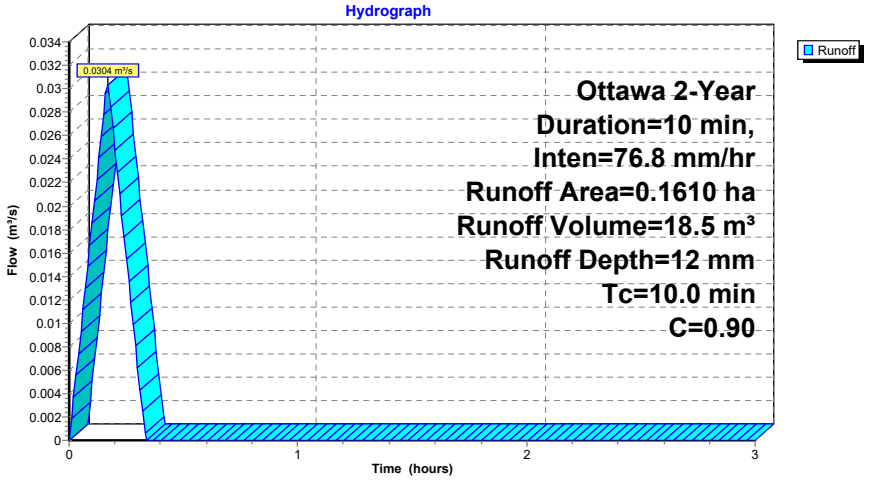
Runoff = 0.0304 m³/s @ 0.17 hrs, Volume= 18.5 m³, Depth= 12 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.1610	0.90	
0.1610		100.00% Pervious Area

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

Subcatchment 12S: Bldg C



Summary for Subcatchment 15S: UnControlled

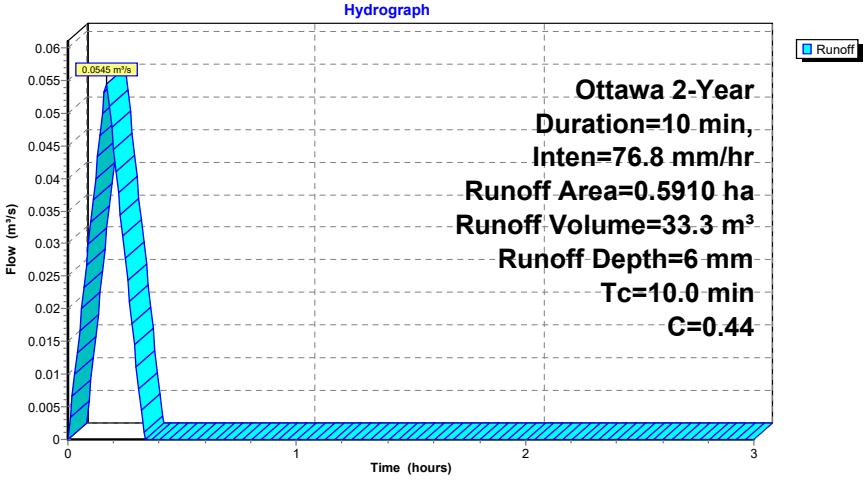
Runoff = 0.0545 m³/s @ 0.17 hrs, Volume= 33.3 m³, Depth= 6 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.0800	0.28	S-U3
0.3070	0.20	S-U5
0.0250	0.90	S-U1
0.0940	0.86	S-U2
0.0850	0.88	S-U4
0.5910	0.44	Weighted Average
0.5910		100.00% Pervious Area

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

Subcatchment 15S: UnControlled



Summary for Subcatchment 16S: External Catchments

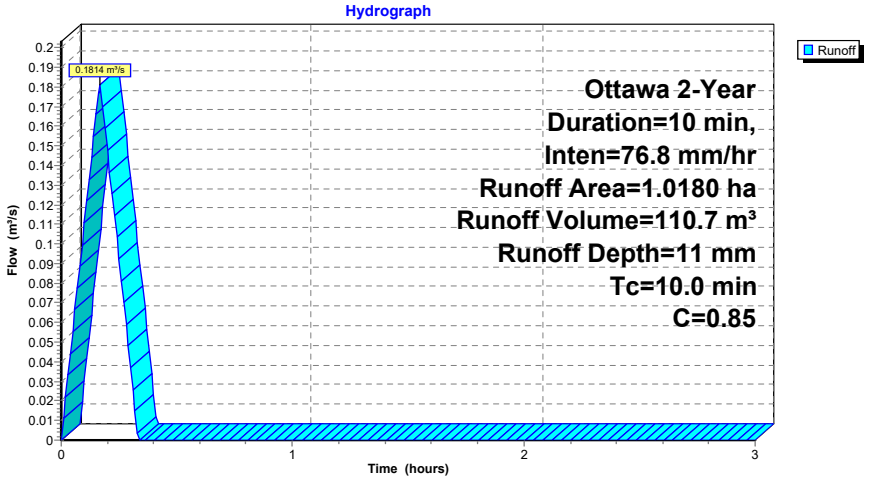
Runoff = 0.1814 m³/s @ 0.17 hrs, Volume= 110.7 m³, Depth= 11 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.5900	0.81	S-EXT1
0.1850	0.90	S-EXT2
0.1530	0.90	S-EXT3
0.0900	0.90	S-EXT4
1.0180	0.85	Weighted Average
1.0180		100.00% Pervious Area

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

Subcatchment 16S: External Catchments



Summary for Subcatchment 41S: S-101

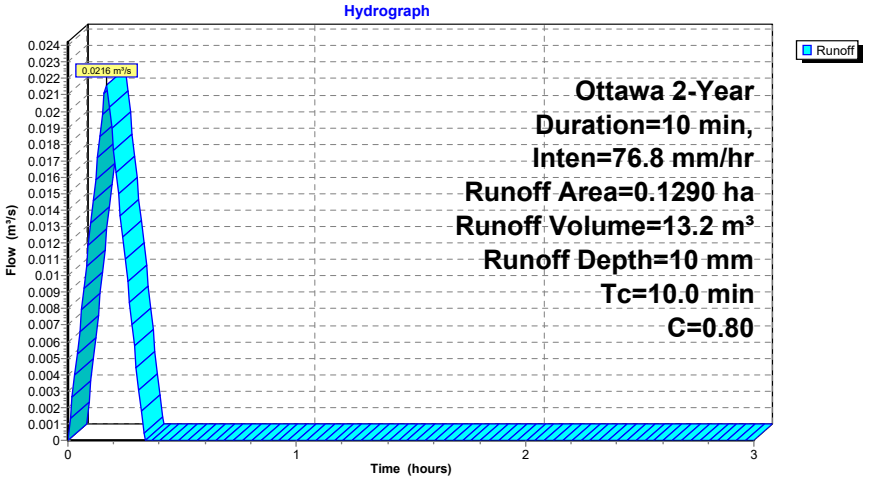
Runoff = 0.0216 m³/s @ 0.17 hrs, Volume= 13.2 m³, Depth= 10 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.1290	0.80	S-101
0.1290		100.00% Pervious Area

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

Subcatchment 41S: S-101



Summary for Subcatchment 42S: S-102

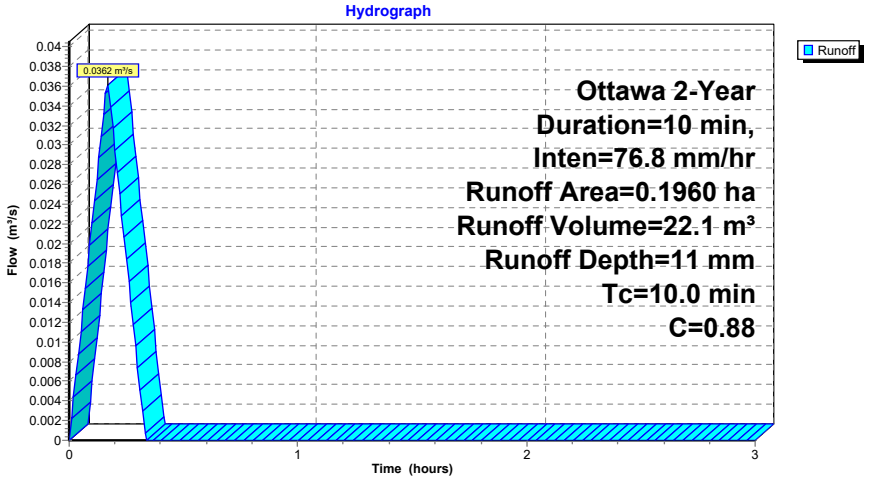
Runoff = 0.0362 m³/s @ 0.17 hrs, Volume= 22.1 m³, Depth= 11 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.1960	0.88	S-102
0.1960		100.00% Pervious Area

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

Subcatchment 42S: S-102



Summary for Subcatchment 44S: S-103

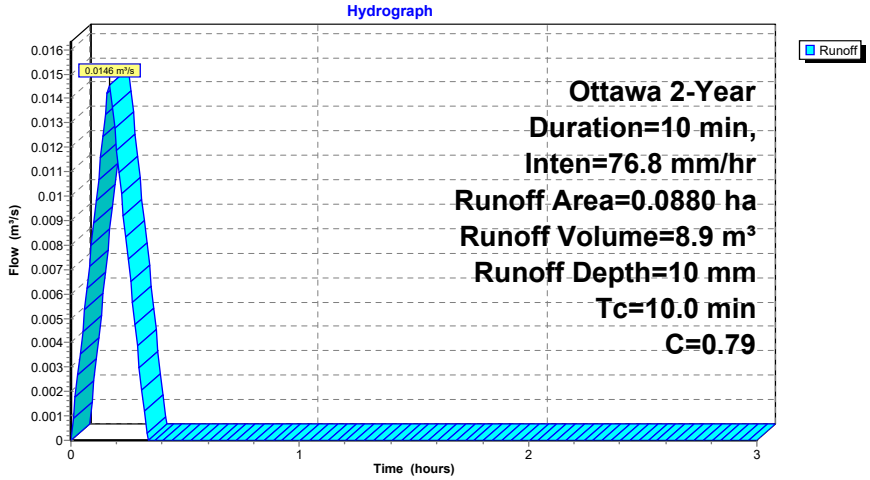
Runoff = 0.0146 m³/s @ 0.17 hrs, Volume= 8.9 m³, Depth= 10 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.0880	0.79	S-103
0.0880		100.00% Pervious Area

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

Subcatchment 44S: S-103



Summary for Subcatchment 46S: S-106

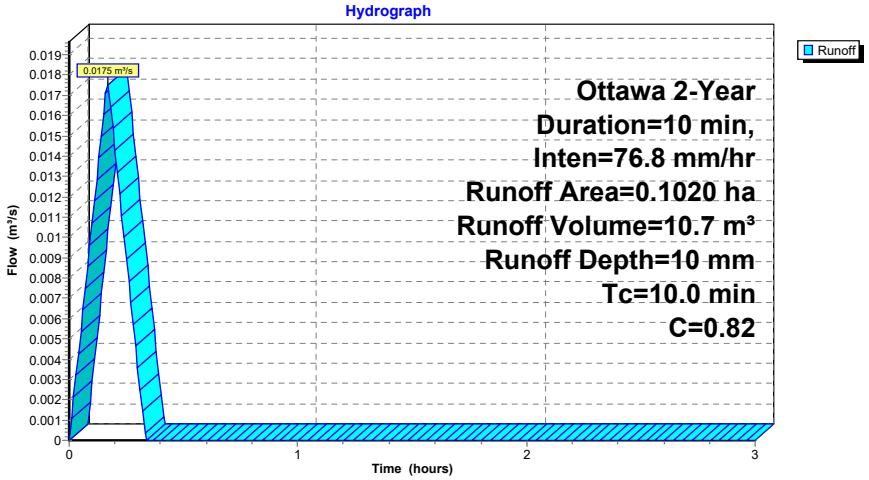
Runoff = 0.0175 m³/s @ 0.17 hrs, Volume= 10.7 m³, Depth= 10 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.1020	0.82	S-106
0.1020		100.00% Pervious Area

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

Subcatchment 46S: S-106



Summary for Subcatchment 48S: S-104

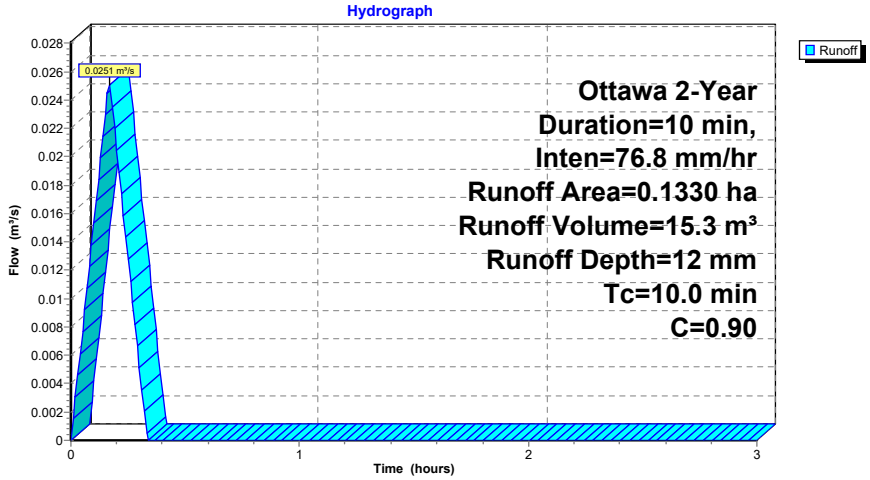
Runoff = 0.0251 m³/s @ 0.17 hrs, Volume= 15.3 m³, Depth= 12 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.1330	0.90	S-104
0.1330		100.00% Pervious Area

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

Subcatchment 48S: S-104



Summary for Subcatchment 50S: S-105

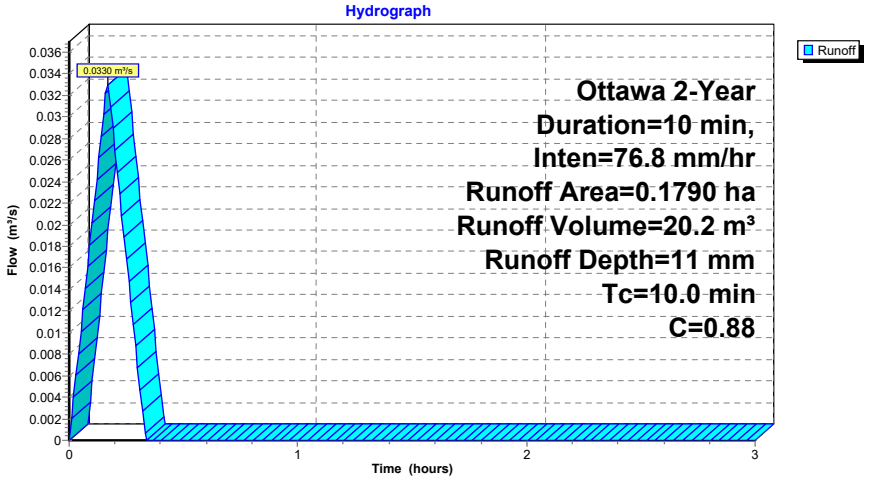
Runoff = 0.0330 m³/s @ 0.17 hrs, Volume= 20.2 m³, Depth= 11 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 2-Year Duration=10 min, Inten=76.8 mm/hr

Area (ha)	C	Description
0.1790	0.88	S-105
0.1790		100.00% Pervious Area

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

Subcatchment 50S: S-105



Summary for Pond 15P: Tank B

Inflow Area = 3,990.0 m², 0.00% Impervious, Inflow Depth = 12 mm for 2-Year event
Inflow = 0.0753 m³/s @ 0.17 hrs, Volume= 45.9 m³
Outflow = 0.0072 m³/s @ 0.32 hrs, Volume= 42.1 m³, Atten= 90%, Lag= 9.0 min
Primary = 0.0072 m³/s @ 0.32 hrs, Volume= 42.1 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 74.304 m @ 0.32 hrs Surf.Area= 100.0 m² Storage= 41.0 m³

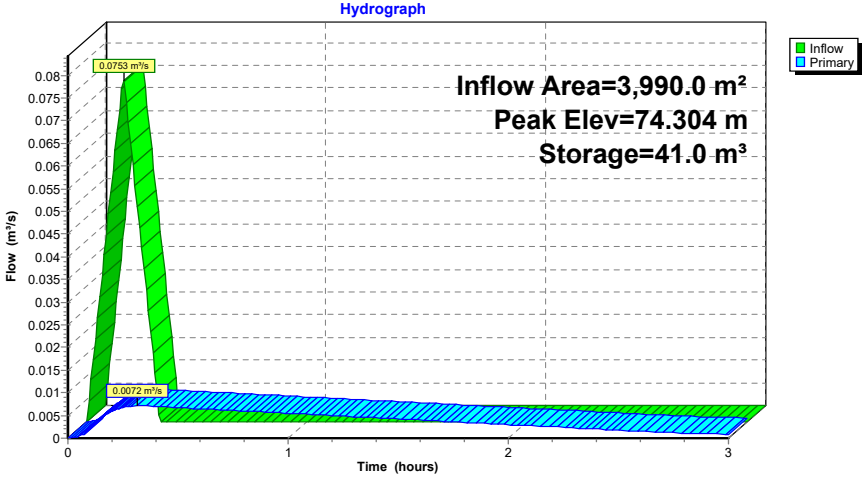
Plug-Flow detention time= 60.3 min calculated for 42.1 m³ (92% of inflow)
Center-of-Mass det. time= 59.7 min (69.7 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	73.894 m	400.0 m³	**10.00 mW x 10.00 mL x 4.00 mH Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	73.894 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0072 m³/s @ 0.32 hrs HW=74.304 m (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.0072 m³/s @ 1.62 m/s)

Pond 15P: Tank B



Summary for Pond 16P: Tank A

Inflow Area = 4,481.0 m², 0.00% Impervious, Inflow Depth = 12 mm for 2-Year event
Inflow = 0.0845 m³/s @ 0.17 hrs, Volume= 51.6 m³
Outflow = 0.0077 m³/s @ 0.32 hrs, Volume= 47.0 m³, Atten= 91%, Lag= 9.1 min
Primary = 0.0077 m³/s @ 0.32 hrs, Volume= 47.0 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 74.519 m @ 0.32 hrs Surf.Area= 100.0 m² Storage= 46.3 m³

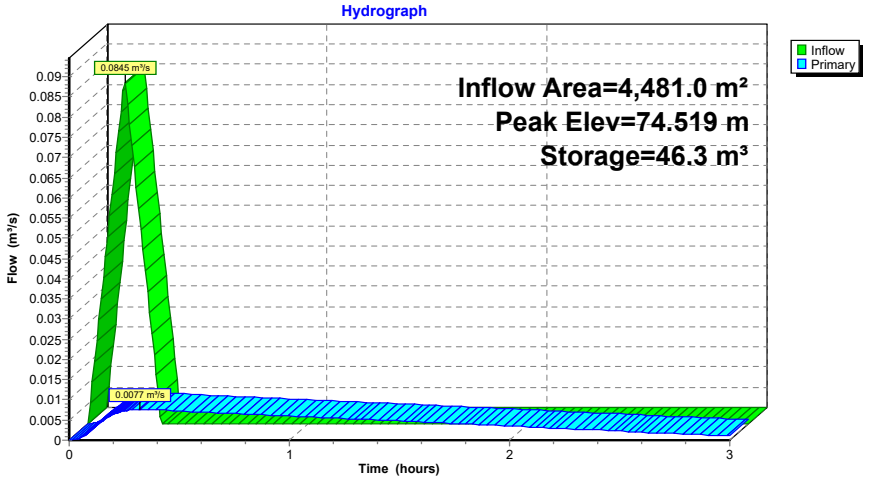
Plug-Flow detention time= 62.3 min calculated for 46.9 m³ (91% of inflow)
Center-of-Mass det. time= 61.9 min (71.9 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	74.056 m	400.0 m³	**10.00 mW x 10.00 mL x 4.00 mH Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	74.056 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0077 m³/s @ 0.32 hrs HW=74.519 m (Free Discharge)
↳**1=Orifice/Grate** (Orifice Controls 0.0077 m³/s @ 1.73 m/s)

Pond 16P: Tank A



Summary for Pond 40P: CBMH105

Inflow Area = 1,290.0 m², 0.00% Impervious, Inflow Depth = 10 mm for 2-Year event
Inflow = 0.0216 m³/s @ 0.17 hrs, Volume= 13.2 m³
Outflow = 0.0128 m³/s @ 0.24 hrs, Volume= 13.1 m³, Atten= 41%, Lag= 4.1 min
Primary = 0.0128 m³/s @ 0.24 hrs, Volume= 13.1 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 76.005 m @ 0.24 hrs Surf.Area= 80.4 m² Storage= 2.8 m³

Plug-Flow detention time= 2.2 min calculated for 13.0 m³ (99% of inflow)
Center-of-Mass det. time= 2.1 min (12.1 - 10.0)

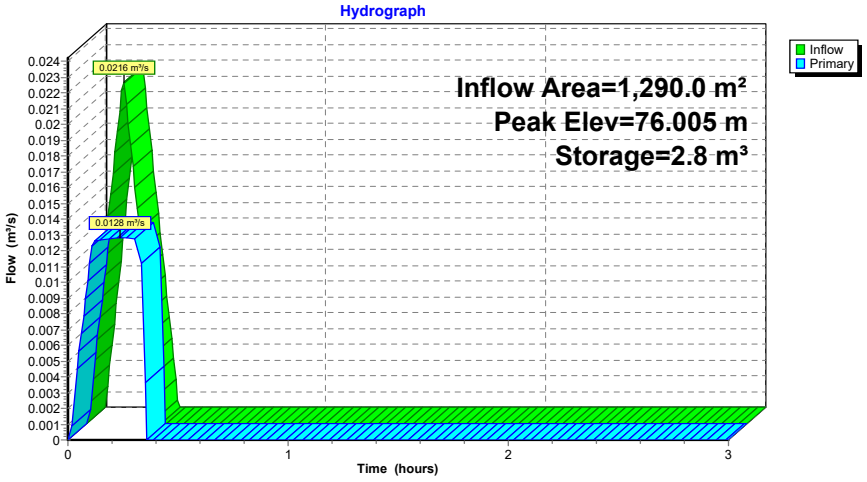
Volume	Invert	Avail.Storage	Storage Description
#1	74.450 m	65.9 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.450	0.4	0.0	0.0
75.950	0.4	0.6	0.6
76.250	435.0	65.3	65.9

Device	Routing	Invert	Outlet Devices
#1	Primary	74.776 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0128 m³/s @ 0.24 hrs HW=76.005 m (Free Discharge)
↳**1=Orifice/Grate** (Orifice Controls 0.0128 m³/s @ 2.90 m/s)

Pond 40P: CBMH105



Summary for Pond 43P: CB01

Inflow Area = 1,960.0 m², 0.00% Impervious, Inflow Depth = 11 mm for 2-Year event
Inflow = 0.0362 m³/s @ 0.17 hrs, Volume= 22.1 m³
Outflow = 0.0136 m³/s @ 0.27 hrs, Volume= 21.9 m³, Atten= 62%, Lag= 6.3 min
Primary = 0.0136 m³/s @ 0.27 hrs, Volume= 21.9 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 76.023 m @ 0.27 hrs Surf.Area= 235.1 m² Storage= 9.3 m³

Plug-Flow detention time= 6.2 min calculated for 21.9 m³ (99% of inflow)
Center-of-Mass det. time= 6.1 min (16.1 - 10.0)

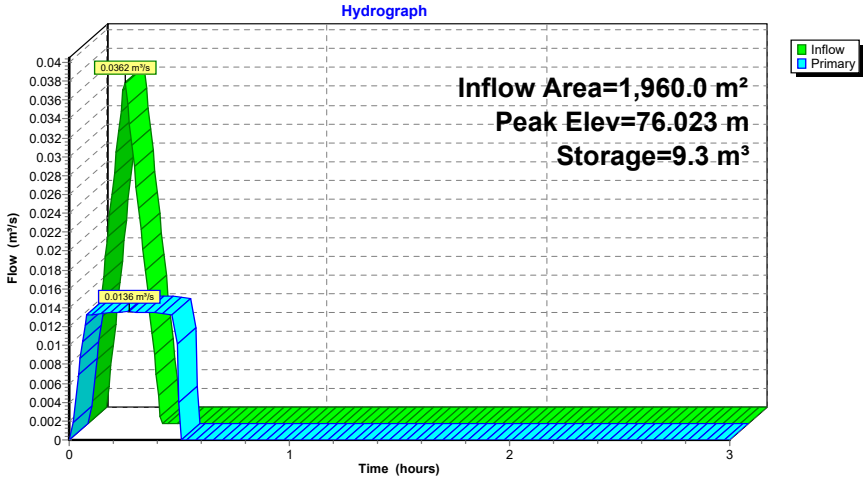
Volume	Invert	Avail.Storage	Storage Description
#1	74.259 m	144.7 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.259	0.4	0.0	0.0
75.950	0.4	0.7	0.7
76.250	960.0	144.1	144.7

Device	Routing	Invert	Outlet Devices
#1	Primary	74.651 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0136 m³/s @ 0.27 hrs HW=76.023 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0136 m³/s @ 3.07 m/s)

Pond 43P: CB01



Summary for Pond 45P: CB02

Inflow Area = 880.0 m², 0.00% Impervious, Inflow Depth = 10 mm for 2-Year event
Inflow = 0.0146 m³/s @ 0.17 hrs, Volume= 8.9 m³
Outflow = 0.0136 m³/s @ 0.18 hrs, Volume= 8.8 m³, Atten= 7%, Lag= 0.8 min
Primary = 0.0136 m³/s @ 0.18 hrs, Volume= 8.8 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 75.777 m @ 0.18 hrs Surf.Area= 0.4 m² Storage= 0.7 m³

Plug-Flow detention time= 0.7 min calculated for 8.8 m³ (98% of inflow)
Center-of-Mass det. time= 0.6 min (10.6 - 10.0)

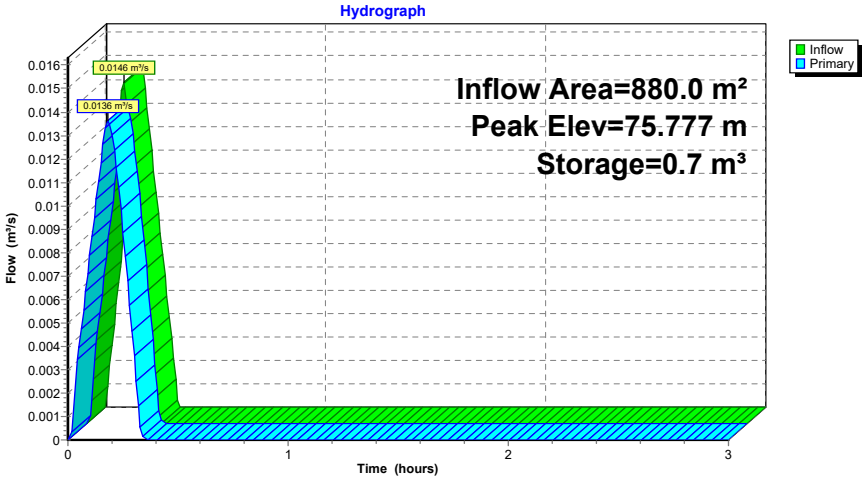
Volume	Invert	Avail.Storage	Storage Description
#1	74.121 m	18.8 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.121	0.4	0.0	0.0
75.950	0.4	0.7	0.7
76.150	180.0	18.0	18.8

Device	Routing	Invert	Outlet Devices
#1	Primary	74.396 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0136 m³/s @ 0.18 hrs HW=75.771 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0136 m³/s @ 3.07 m/s)

Pond 45P: CB02



Summary for Pond 47P: CB04

Inflow Area = 1,020.0 m², 0.00% Impervious, Inflow Depth = 10 mm for 2-Year event
Inflow = 0.0175 m³/s @ 0.17 hrs, Volume= 10.7 m³
Outflow = 0.0171 m³/s @ 0.17 hrs, Volume= 10.6 m³, Atten= 2%, Lag= 0.4 min
Primary = 0.0171 m³/s @ 0.17 hrs, Volume= 10.6 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 75.316 m @ 0.17 hrs Surf.Area= 0.4 m² Storage= 0.4 m³

Plug-Flow detention time= 0.5 min calculated for 10.6 m³ (99% of inflow)
Center-of-Mass det. time= 0.3 min (10.3 - 10.0)

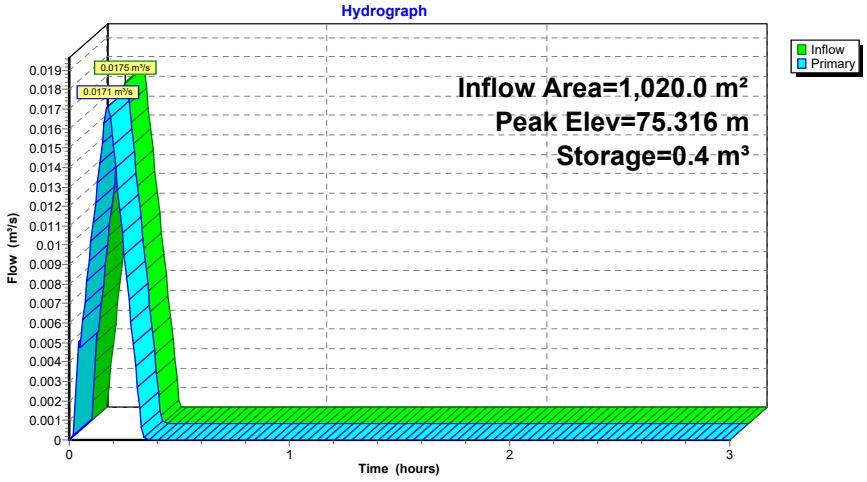
Volume	Invert	Avail.Storage	Storage Description
#1	74.221 m	12.3 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.221	0.4	0.0	0.0
76.690	0.4	1.0	1.0
76.840	150.0	11.3	12.3

Device	Routing	Invert	Outlet Devices
#1	Primary	74.594 m	**100 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0170 m³/s @ 0.17 hrs HW=75.309 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0170 m³/s @ 2.17 m/s)

Pond 47P: CB04



Summary for Pond 49P: CB05

Inflow Area = 1,330.0 m², 0.00% Impervious, Inflow Depth = 12 mm for 2-Year event
Inflow = 0.0251 m³/s @ 0.17 hrs, Volume= 15.3 m³
Outflow = 0.0131 m³/s @ 0.25 hrs, Volume= 15.2 m³, Atten= 48%, Lag= 4.8 min
Primary = 0.0131 m³/s @ 0.25 hrs, Volume= 15.2 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 75.578 m @ 0.25 hrs Surf.Area= 91.6 m² Storage= 4.2 m³

Plug-Flow detention time= 3.0 min calculated for 15.2 m³ (99% of inflow)
Center-of-Mass det. time= 2.9 min (12.9 - 10.0)

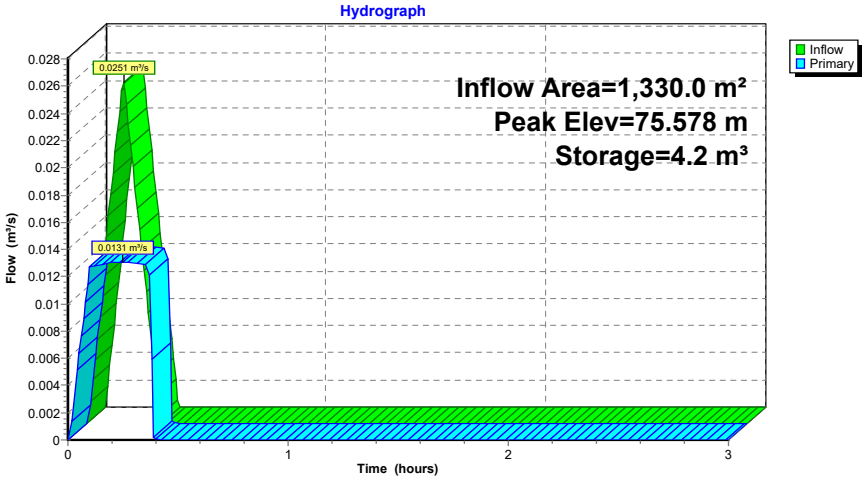
Volume	Invert	Avail.Storage	Storage Description
#1	74.028 m	53.1 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.028	0.4	0.0	0.0
75.500	0.4	0.6	0.6
75.800	350.0	52.6	53.1

Device	Routing	Invert	Outlet Devices
#1	Primary	74.297 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0131 m³/s @ 0.25 hrs HW=75.578 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0131 m³/s @ 2.96 m/s)

Pond 49P: CB05



Summary for Pond 51P: CB03

Inflow Area = 1,790.0 m², 0.00% Impervious, Inflow Depth = 11 mm for 2-Year event
Inflow = 0.0330 m³/s @ 0.17 hrs, Volume= 20.2 m³
Outflow = 0.0136 m³/s @ 0.27 hrs, Volume= 19.7 m³, Atten= 59%, Lag= 5.9 min
Primary = 0.0136 m³/s @ 0.27 hrs, Volume= 19.7 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 75.560 m @ 0.27 hrs Surf.Area= 129.0 m² Storage= 8.1 m³

Plug-Flow detention time= 5.5 min calculated for 19.7 m³ (98% of inflow)
Center-of-Mass det. time= 5.3 min (15.3 - 10.0)

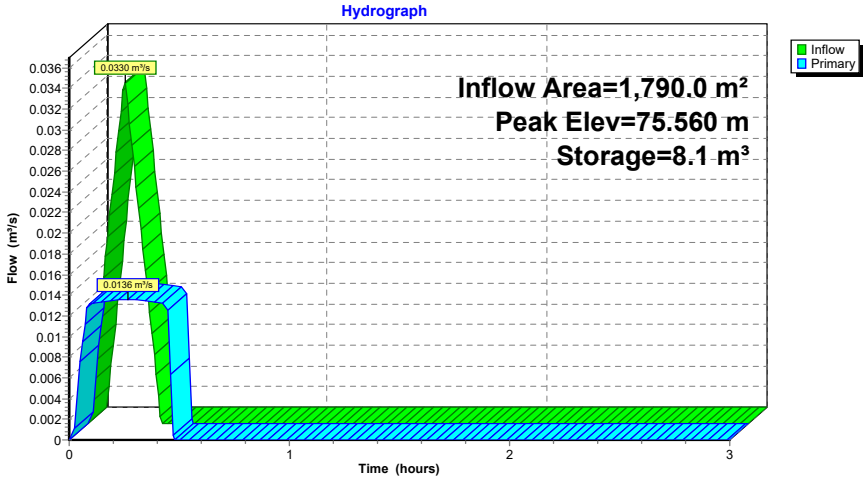
Volume	Invert	Avail.Storage	Storage Description
#1	73.097 m	53.5 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
73.097	0.4	0.0	0.0
75.450	0.4	0.9	0.9
75.750	350.0	52.6	53.5

Device	Routing	Invert	Outlet Devices
#1	Primary	74.183 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0136 m³/s @ 0.27 hrs HW=75.560 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0136 m³/s @ 3.08 m/s)

Pond 51P: CB03

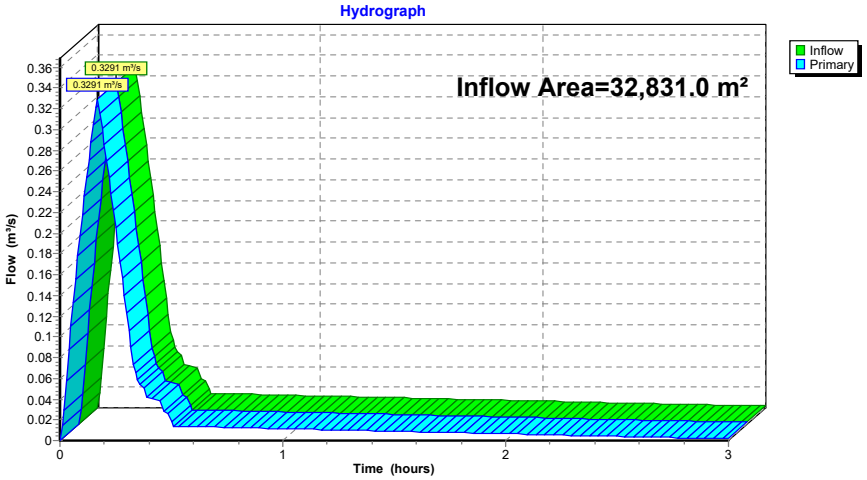


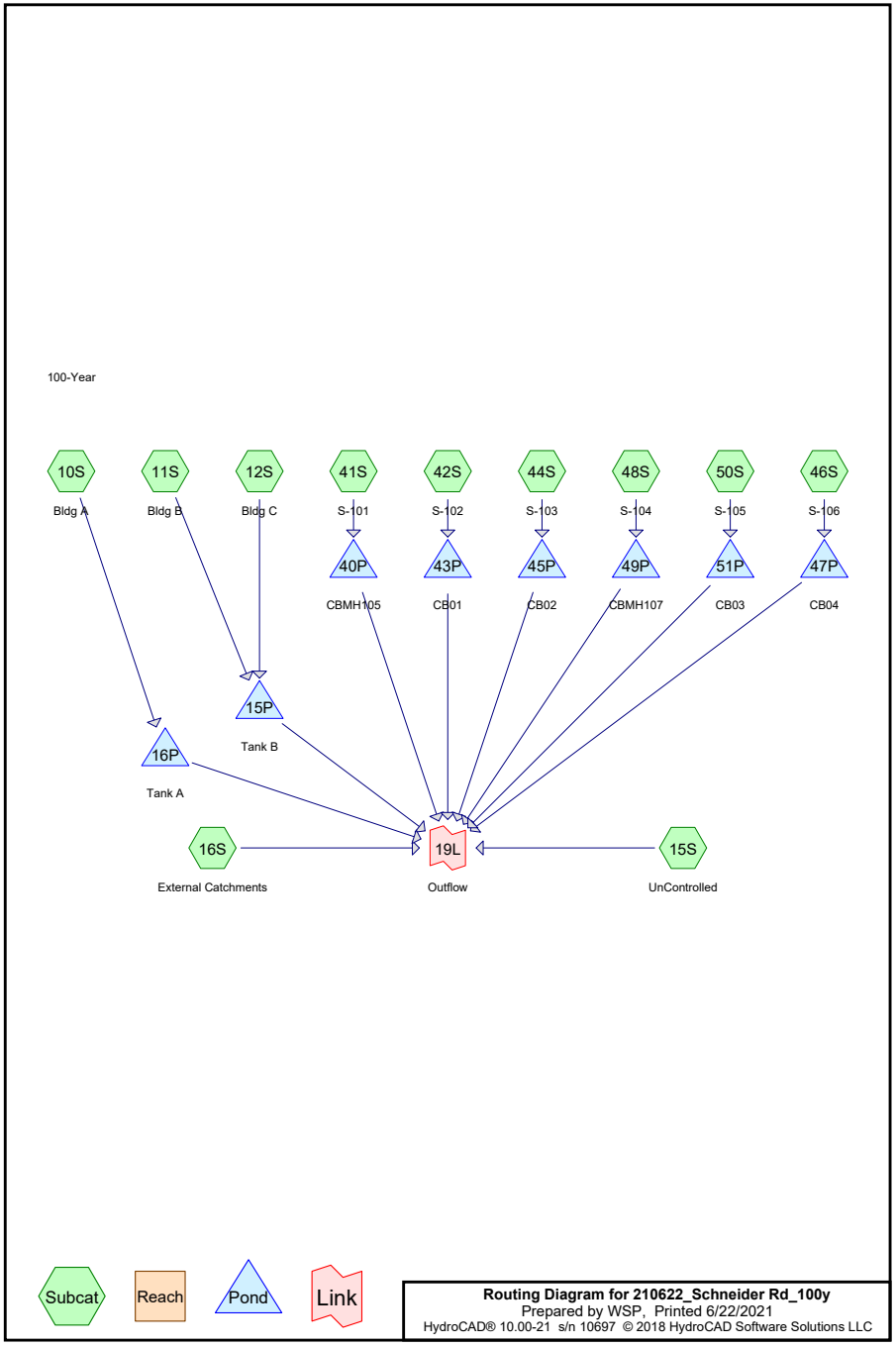
Summary for Link 19L: Outflow

Inflow Area = 32,831.0 m², 0.00% Impervious, Inflow Depth > 10 mm for 2-Year event
Inflow = 0.3291 m³/s @ 0.17 hrs, Volume= 322.4 m³
Primary = 0.3291 m³/s @ 0.17 hrs, Volume= 322.4 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 19L: Outflow





Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
8,471.0	1.00	(10S, 11S, 12S)
1,290.0	1.00	S-101 (41S)
1,960.0	1.00	S-102 (42S)
880.0	1.00	S-103 (44S)
1,330.0	1.00	S-104 (48S)
1,790.0	1.00	S-105 (50S)
1,020.0	1.00	S-106 (46S)
5,900.0	1.00	S-EXT1 (16S)
1,850.0	1.00	S-EXT2 (16S)
1,530.0	1.00	S-EXT3 (16S)
900.0	1.00	S-EXT4 (16S)
250.0	1.00	S-U1 (15S)
940.0	0.83	S-U2 (15S)
800.0	0.35	S-U3 (15S)
850.0	1.00	S-U4 (15S)
3,070.0	0.25	S-U5 (15S)
32,831.0	**0.91**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-meters)	Soil Group	Subcatchment Numbers
0.0	HSG A	
0.0	HSG B	
0.0	HSG C	
0.0	HSG D	
32,831.0	Other	10S, 11S, 12S, 15S, 16S, 41S, 42S, 44S, 46S, 48S, 50S
32,831.0		**TOTAL AREA**

Ground Covers (selected 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	Subca Numbe
0.0	0.0	0.0	0.0	8,471.0	8,471.0		
0.0	0.0	0.0	0.0	1,290.0	1,290.0	S-101	
0.0	0.0	0.0	0.0	1,960.0	1,960.0	S-102	
0.0	0.0	0.0	0.0	880.0	880.0	S-103	
0.0	0.0	0.0	0.0	1,330.0	1,330.0	S-104	
0.0	0.0	0.0	0.0	1,790.0	1,790.0	S-105	
0.0	0.0	0.0	0.0	1,020.0	1,020.0	S-106	
0.0	0.0	0.0	0.0	5,900.0	5,900.0	S-EXT1	
0.0	0.0	0.0	0.0	1,850.0	1,850.0	S-EXT2	
0.0	0.0	0.0	0.0	1,530.0	1,530.0	S-EXT3	
0.0	0.0	0.0	0.0	900.0	900.0	S-EXT4	
0.0	0.0	0.0	0.0	250.0	250.0	S-U1	
0.0	0.0	0.0	0.0	940.0	940.0	S-U2	
0.0	0.0	0.0	0.0	800.0	800.0	S-U3	
0.0	0.0	0.0	0.0	850.0	850.0	S-U4	
0.0	0.0	0.0	0.0	3,070.0	3,070.0	S-U5	
0.0	**0.0**	**0.0**	**0.0**	**32,831.0**	**32,831.0**	**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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment10S: Bldg A Runoff Area=0.4481 ha 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.2184 m³/s 133.3 m³

Subcatchment11S: Bldg B Runoff Area=0.2380 ha 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.1160 m³/s 70.8 m³

Subcatchment12S: Bldg C Runoff Area=0.1610 ha 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.0785 m³/s 47.9 m³

Subcatchment15S: UnControlled Runoff Area=0.5910 ha 18.61% Impervious Runoff Depth=15 mm
Tc=10.0 min C=0.50 Runoff=0.1440 m³/s 87.9 m³

Subcatchment16S: External Runoff Area=1.0180 ha 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.4961 m³/s 302.8 m³

Subcatchment41S: S-101 Runoff Area=0.1290 ha 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.0629 m³/s 38.4 m³

Subcatchment42S: S-102 Runoff Area=0.1960 ha 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.0955 m³/s 58.3 m³

Subcatchment44S: S-103 Runoff Area=0.0880 ha 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.0429 m³/s 26.2 m³

Subcatchment46S: S-106 Runoff Area=0.1020 ha 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.0497 m³/s 30.3 m³

Subcatchment48S: S-104 Runoff Area=0.1330 ha 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.0648 m³/s 39.6 m³

Subcatchment50S: S-105 Runoff Area=0.1790 ha 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.0872 m³/s 53.2 m³

Pond 15P: Tank B Peak Elev=1.100 m Storage=110.0 m³ Inflow=0.1944 m³/s 118.7 m³
Outflow=0.0121 m³/s 93.3 m³

Pond 16P: Tank A Peak Elev=1.240 m Storage=124.0 m³ Inflow=0.2184 m³/s 133.3 m³
Outflow=0.0129 m³/s 101.3 m³

Pond 40P: CBMH105 Peak Elev=76.134 m Storage=24.5 m³ Inflow=0.0629 m³/s 38.4 m³
Outflow=0.0135 m³/s 38.4 m³

Pond 43P: CB01 Peak Elev=76.114 m Storage=43.2 m³ Inflow=0.0955 m³/s 58.3 m³
Outflow=0.0140 m³/s 58.3 m³

Pond 45P: CB02 Peak Elev=76.110 m Storage=11.8 m³ Inflow=0.0429 m³/s 26.2 m³
Outflow=0.0152 m³/s 26.2 m³

Pond 47P: CB04 Peak Elev=76.790 m Storage=5.6 m³ Inflow=0.0497 m³/s 30.3 m³
Outflow=0.0306 m³/s 30.4 m³

Pond 49P: CBMH107 Peak Elev=75.713 m Storage=25.5 m³ Inflow=0.0648 m³/s 39.6 m³
Outflow=0.0138 m³/s 39.6 m³

Pond 51P: CB03 Peak Elev=75.616 m Storage=38.5 m³ Inflow=0.0872 m³/s 53.2 m³
Outflow=0.0139 m³/s 53.2 m³

Link 19L: Outflow Inflow=0.7574 m³/s 831.5 m³
Primary=0.7574 m³/s 831.5 m³

Total Runoff Area = 32,831.0 m² Runoff Volume = 888.7 m³ Average Runoff Depth = 27 mm
14.65% Pervious = 4,810.0 m² 85.35% Impervious = 28,021.0 m²

Summary for Subcatchment 10S: Bldg A

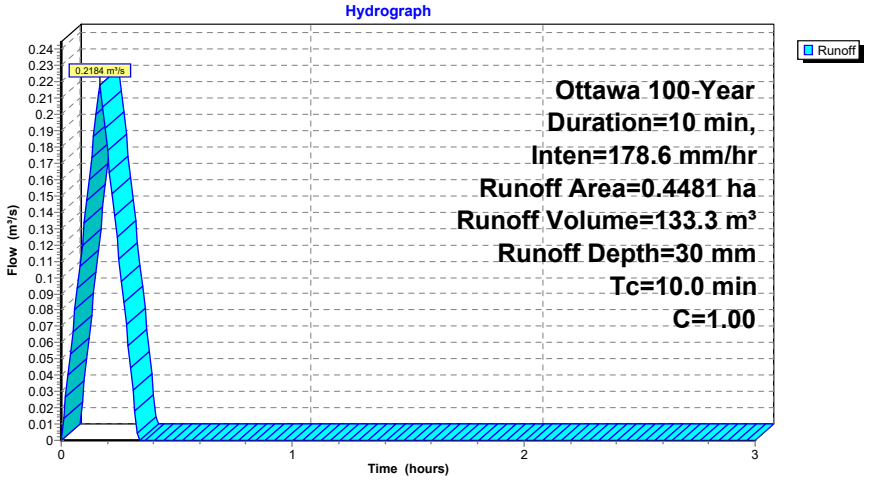
Runoff = 0.2184 m³/s @ 0.17 hrs, Volume= 133.3 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.4481	1.00	
0.4481		100.00% Impervious Area

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

Subcatchment 10S: Bldg A



Summary for Subcatchment 11S: Bldg B

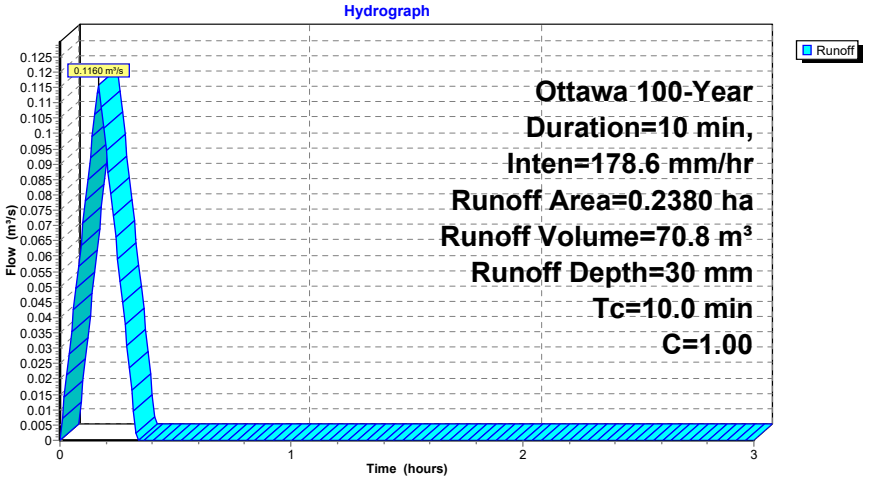
Runoff = 0.1160 m³/s @ 0.17 hrs, Volume= 70.8 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.2380	1.00	
0.2380		100.00% Impervious Area

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

Subcatchment 11S: Bldg B



Summary for Subcatchment 12S: Bldg C

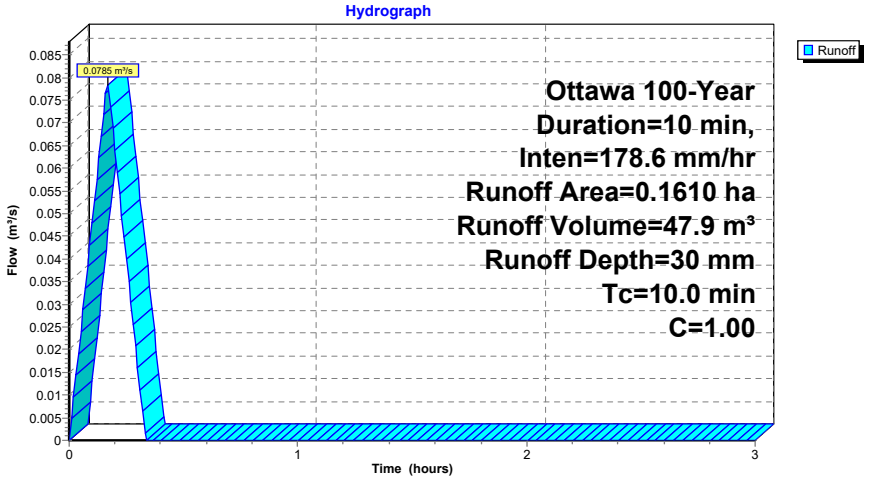
Runoff = 0.0785 m³/s @ 0.17 hrs, Volume= 47.9 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.1610	1.00	
0.1610		100.00% Impervious Area

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

Subcatchment 12S: Bldg C



Summary for Subcatchment 15S: UnControlled

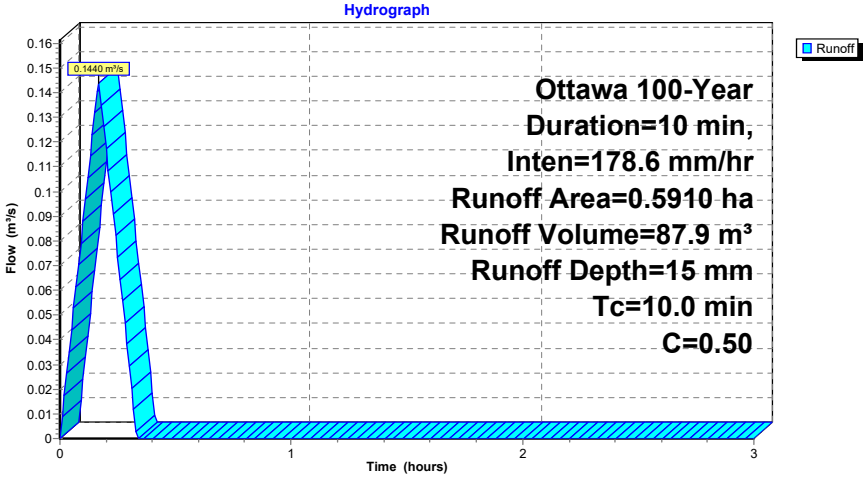
Runoff = 0.1440 m³/s @ 0.17 hrs, Volume= 87.9 m³, Depth= 15 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.0250	1.00	S-U1
0.0940	0.83	S-U2
0.0800	0.35	S-U3
0.0850	1.00	S-U4
0.3070	0.25	S-U5
0.5910	0.50	Weighted Average
0.4810		81.39% Pervious Area
0.1100		18.61% Impervious Area

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

Subcatchment 15S: UnControlled



Summary for Subcatchment 16S: External Catchments

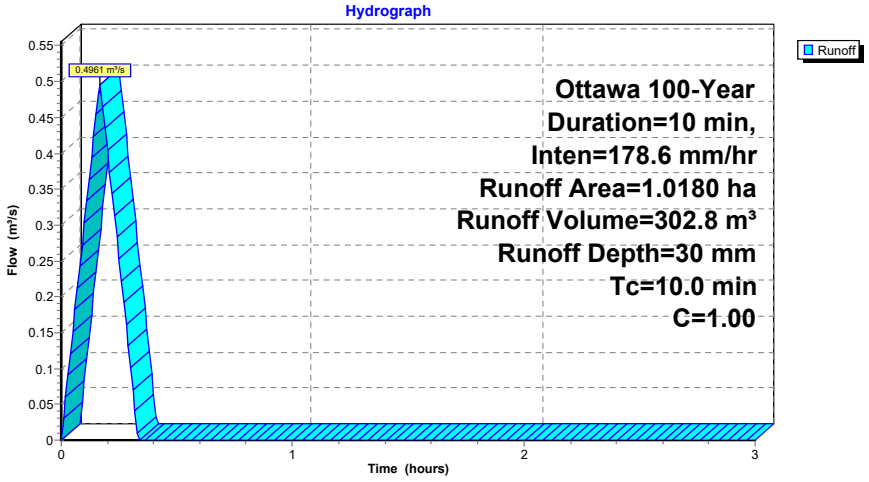
Runoff = 0.4961 m³/s @ 0.17 hrs, Volume= 302.8 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.5900	1.00	S-EXT1
0.1850	1.00	S-EXT2
0.1530	1.00	S-EXT3
0.0900	1.00	S-EXT4
1.0180	1.00	Weighted Average
1.0180		100.00% Impervious Area

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

Subcatchment 16S: External Catchments



Summary for Subcatchment 41S: S-101

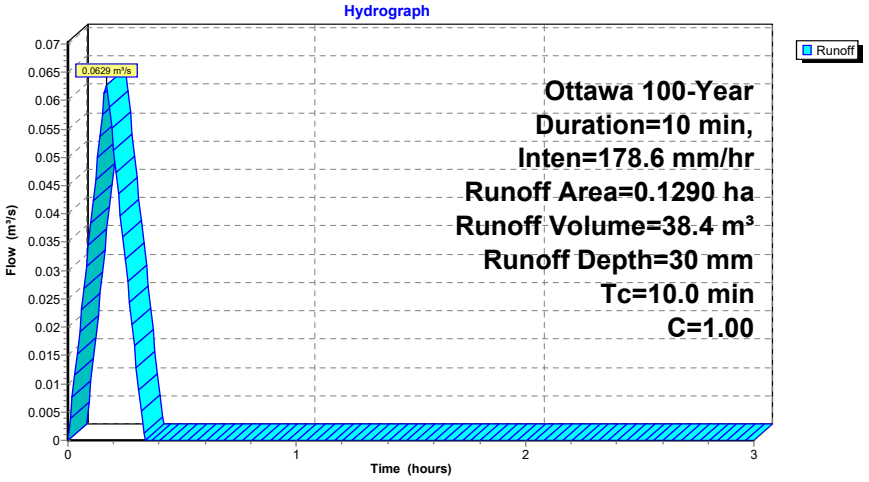
Runoff = 0.0629 m³/s @ 0.17 hrs, Volume= 38.4 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.1290	1.00	S-101
0.1290		100.00% Impervious Area

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

Subcatchment 41S: S-101



Summary for Subcatchment 42S: S-102

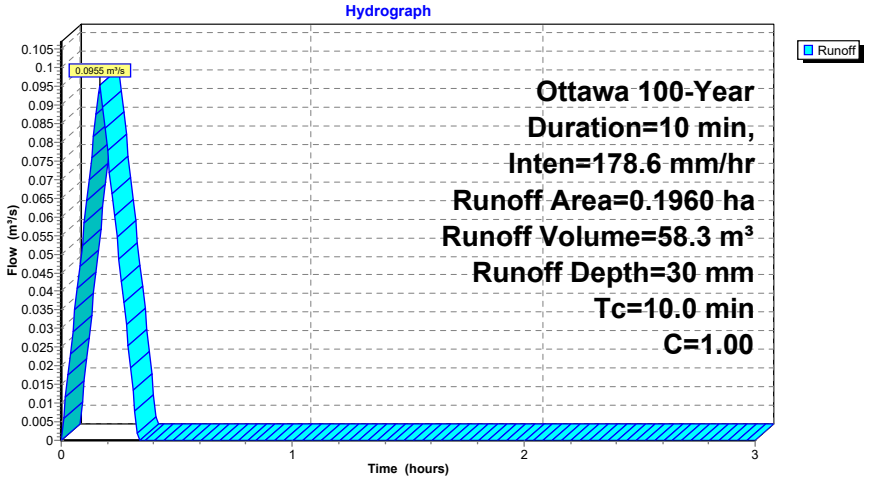
Runoff = 0.0955 m³/s @ 0.17 hrs, Volume= 58.3 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.1960	1.00	S-102
0.1960		100.00% Impervious Area

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

Subcatchment 42S: S-102



Summary for Subcatchment 44S: S-103

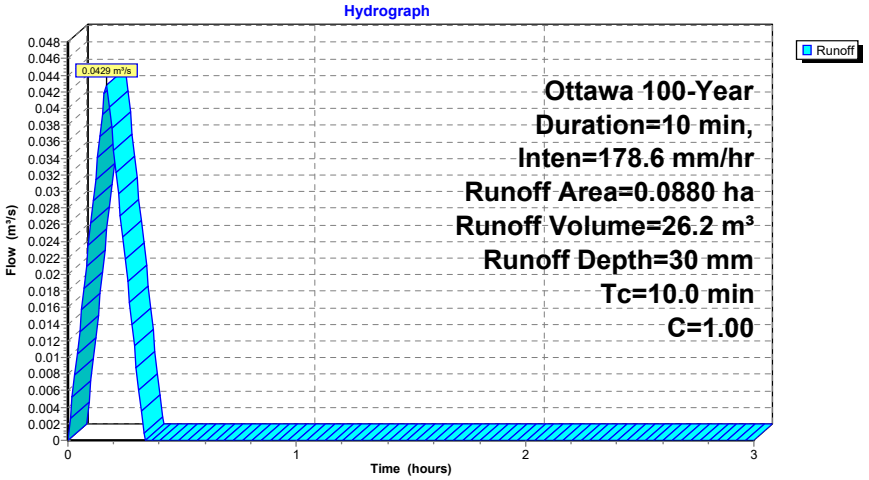
Runoff = 0.0429 m³/s @ 0.17 hrs, Volume= 26.2 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.0880	1.00	S-103
0.0880		100.00% Impervious Area

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

Subcatchment 44S: S-103



Summary for Subcatchment 46S: S-106

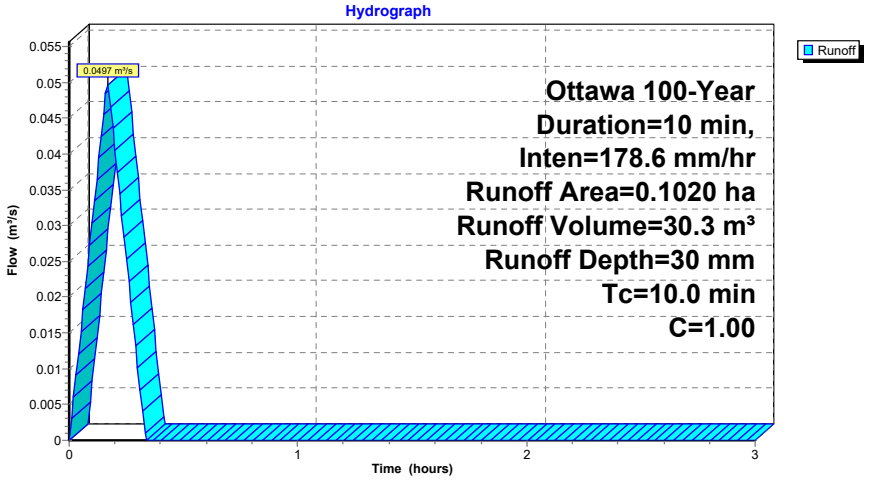
Runoff = 0.0497 m³/s @ 0.17 hrs, Volume= 30.3 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.1020	1.00	S-106
0.1020		100.00% Impervious Area

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

Subcatchment 46S: S-106



Summary for Subcatchment 48S: S-104

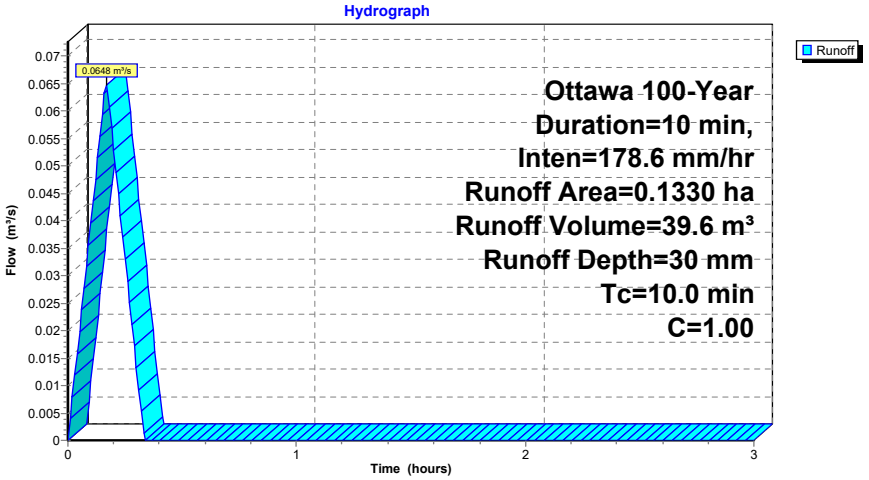
Runoff = 0.0648 m³/s @ 0.17 hrs, Volume= 39.6 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.1330	1.00	S-104
0.1330		100.00% Impervious Area

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

Subcatchment 48S: S-104



Summary for Subcatchment 50S: S-105

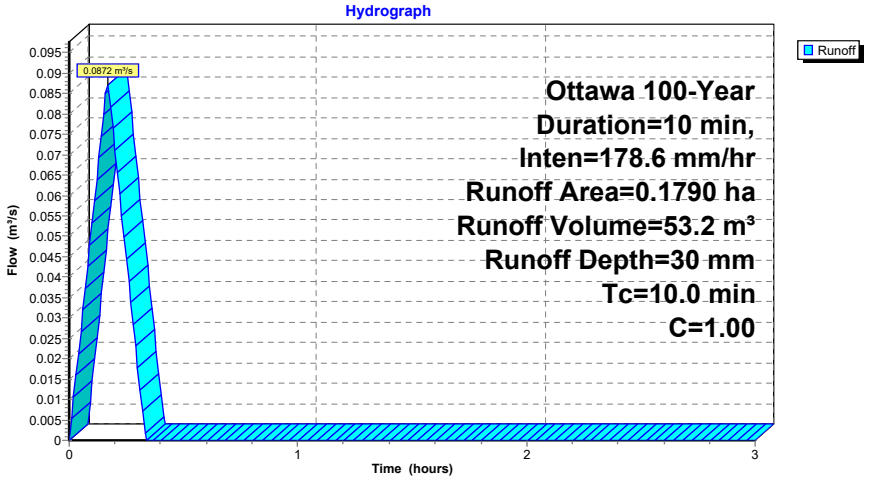
Runoff = 0.0872 m³/s @ 0.17 hrs, Volume= 53.2 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (ha)	C	Description
0.1790	1.00	S-105
0.1790		100.00% Impervious Area

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

Subcatchment 50S: S-105



Summary for Pond 15P: Tank B

Inflow Area = 3,990.0 m², 100.00% Impervious, Inflow Depth = 30 mm for 100-Year event
Inflow = 0.1944 m³/s @ 0.17 hrs, Volume= 118.7 m³
Outflow = 0.0121 m³/s @ 0.32 hrs, Volume= 93.3 m³, Atten= 94%, Lag= 9.3 min
Primary = 0.0121 m³/s @ 0.32 hrs, Volume= 93.3 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 1.100 m @ 0.32 hrs Surf.Area= 100.0 m² Storage= 110.0 m³

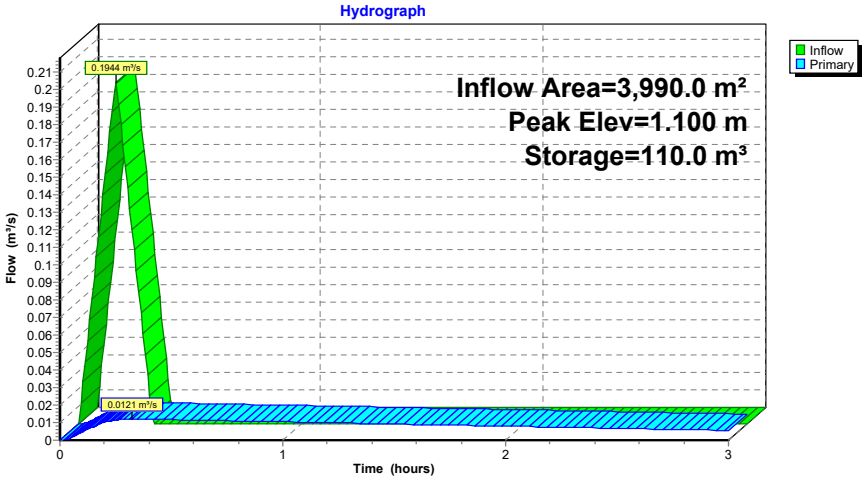
Plug-Flow detention time= 74.2 min calculated for 93.3 m³ (79% of inflow)
Center-of-Mass det. time= 72.7 min (82.7 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	400.0 m³	**10.00 mW x 10.00 mL x 4.00 mH Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.000 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0121 m³/s @ 0.32 hrs HW=1.099 m (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.0121 m³/s @ 2.74 m/s)

Pond 15P: Tank B



Summary for Pond 16P: Tank A

Inflow Area = 4,481.0 m², 100.00% Impervious, Inflow Depth = 30 mm for 100-Year event
Inflow = 0.2184 m³/s @ 0.17 hrs, Volume= 133.3 m³
Outflow = 0.0129 m³/s @ 0.32 hrs, Volume= 101.3 m³, Atten= 94%, Lag= 9.4 min
Primary = 0.0129 m³/s @ 0.32 hrs, Volume= 101.3 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 1.240 m @ 0.32 hrs Surf.Area= 100.0 m² Storage= 124.0 m³

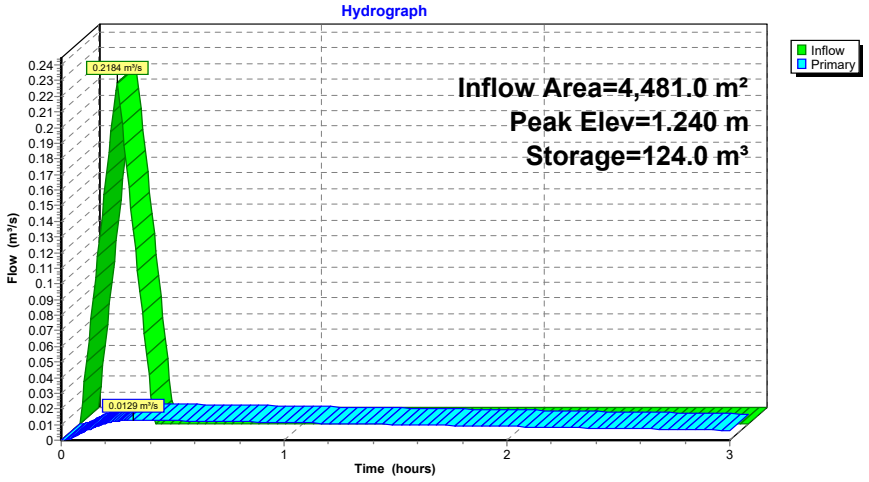
Plug-Flow detention time= 75.3 min calculated for 101.3 m³ (76% of inflow)
Center-of-Mass det. time= 73.6 min (83.6 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	400.0 m³	**10.00 mW x 10.00 mL x 4.00 mH Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.000 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0129 m³/s @ 0.32 hrs HW=1.239 m (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.0129 m³/s @ 2.91 m/s)

Pond 16P: Tank A



Summary for Pond 40P: CBMH105

Inflow Area = 1,290.0 m², 100.00% Impervious, Inflow Depth = 30 mm for 100-Year event
Inflow = 0.0629 m³/s @ 0.17 hrs, Volume= 38.4 m³
Outflow = 0.0135 m³/s @ 0.30 hrs, Volume= 38.4 m³, Atten= 79%, Lag= 7.8 min
Primary = 0.0135 m³/s @ 0.30 hrs, Volume= 38.4 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 76.134 m @ 0.30 hrs Surf.Area= 261.7 m² Storage= 24.5 m³

Plug-Flow detention time= 15.7 min calculated for 38.3 m³ (100% of inflow)
Center-of-Mass det. time= 15.7 min (25.7 - 10.0)

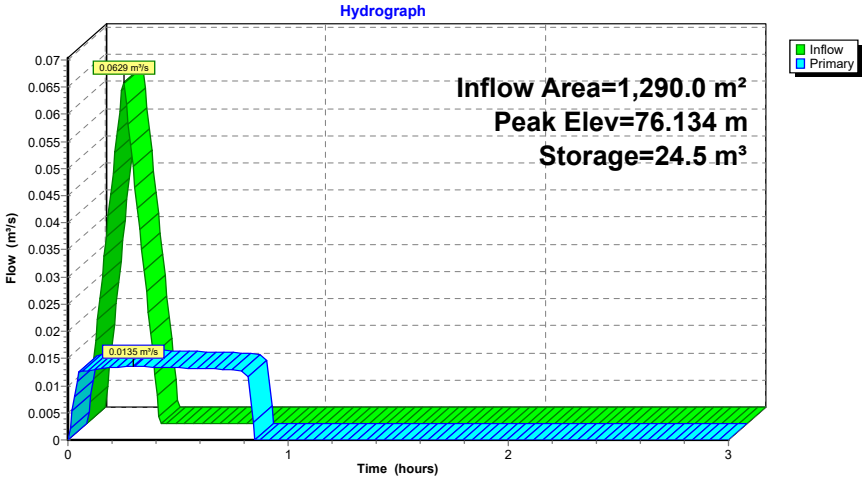
Volume	Invert	Avail.Storage	Storage Description
#1	74.776 m	64.6 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.776	0.4	0.0	0.0
75.950	0.4	0.5	0.5
76.250	427.0	64.1	64.6

Device	Routing	Invert	Outlet Devices
#1	Primary	74.776 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0135 m³/s @ 0.30 hrs HW=76.134 m (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.0135 m³/s @ 3.05 m/s)

Pond 40P: CBMH105



Summary for Pond 43P: CB01

Inflow Area = 1,960.0 m², 100.00% Impervious, Inflow Depth = 30 mm for 100-Year event
Inflow = 0.0955 m³/s @ 0.17 hrs, Volume= 58.3 m³
Outflow = 0.0140 m³/s @ 0.31 hrs, Volume= 58.3 m³, Atten= 85%, Lag= 8.5 min
Primary = 0.0140 m³/s @ 0.31 hrs, Volume= 58.3 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 76.114 m @ 0.31 hrs Surf.Area= 521.7 m² Storage= 43.2 m³

Plug-Flow detention time= 26.3 min calculated for 58.1 m³ (100% of inflow)
Center-of-Mass det. time= 26.4 min (36.4 - 10.0)

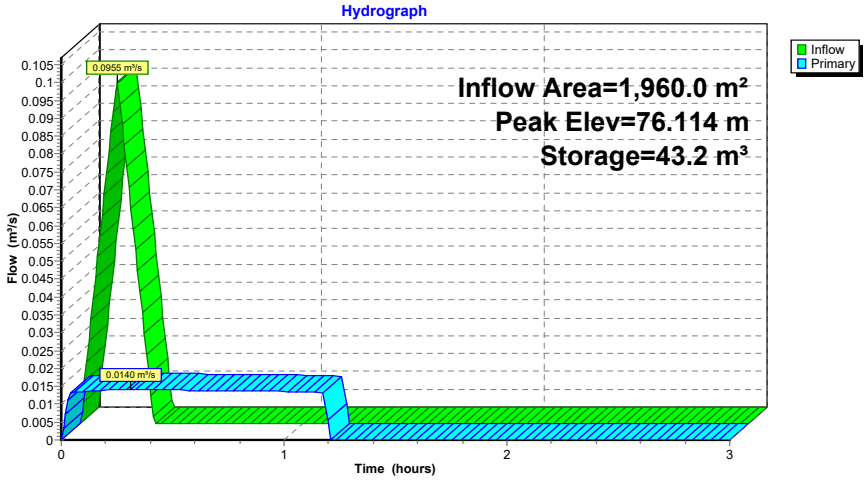
Volume	Invert	Avail.Storage	Storage Description
#1	74.651 m	144.0 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.651	0.4	0.0	0.0
75.950	0.4	0.5	0.5
76.250	956.0	143.5	144.0

Device	Routing	Invert	Outlet Devices
#1	Primary	74.651 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0140 m³/s @ 0.31 hrs HW=76.114 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0140 m³/s @ 3.17 m/s)

Pond 43P: CB01



Summary for Pond 45P: CB02

Inflow Area = 880.0 m², 100.00% Impervious, Inflow Depth = 30 mm for 100-Year event
Inflow = 0.0429 m³/s @ 0.17 hrs, Volume= 26.2 m³
Outflow = 0.0152 m³/s @ 0.28 hrs, Volume= 26.2 m³, Atten= 65%, Lag= 6.5 min
Primary = 0.0152 m³/s @ 0.28 hrs, Volume= 26.2 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 76.110 m @ 0.28 hrs Surf.Area= 139.2 m² Storage= 11.8 m³

Plug-Flow detention time= 6.8 min calculated for 26.1 m³ (100% of inflow)
Center-of-Mass det. time= 6.8 min (16.8 - 10.0)

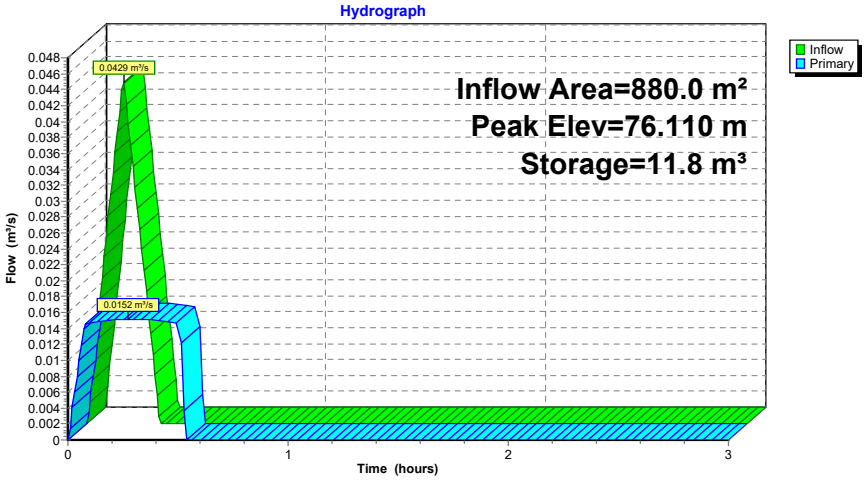
Volume	Invert	Avail.Storage	Storage Description
#1	74.396 m	18.1 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.396	0.4	0.0	0.0
75.950	0.4	0.6	0.6
76.150	174.0	17.4	18.1

Device	Routing	Invert	Outlet Devices
#1	Primary	74.396 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0152 m³/s @ 0.28 hrs HW=76.110 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0152 m³/s @ 3.44 m/s)

Pond 45P: CB02



Summary for Pond 47P: CB04

Inflow Area = 1,020.0 m²,100.00% Impervious, Inflow Depth = 30 mm for 100-Year event
Inflow = 0.0497 m³/s @ 0.17 hrs, Volume= 30.3 m³
Outflow = 0.0306 m³/s @ 0.23 hrs, Volume= 30.4 m³, Atten= 38%, Lag= 3.9 min
Primary = 0.0306 m³/s @ 0.23 hrs, Volume= 30.4 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 76.790 m @ 0.23 hrs Surf.Area= 94.0 m² Storage= 5.6 m³

Plug-Flow detention time= 1.6 min calculated for 30.3 m³ (100% of inflow)
Center-of-Mass det. time= 1.7 min (11.7 - 10.0)

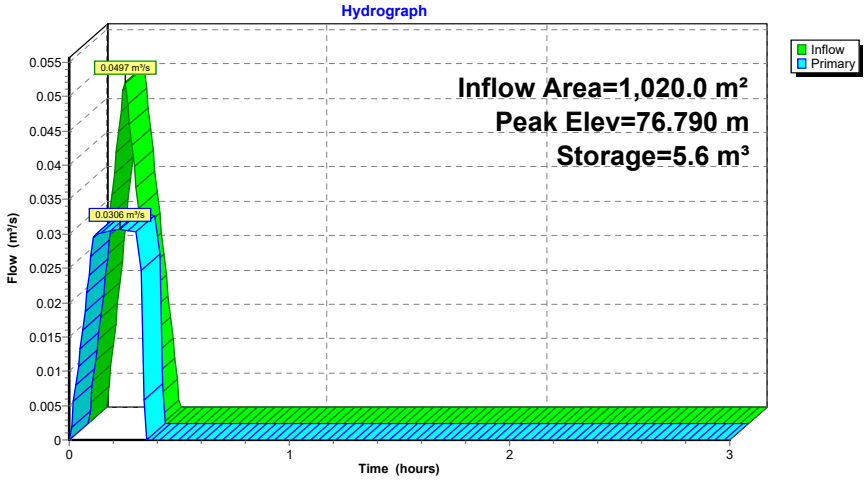
Volume	Invert	Avail.Storage	Storage Description
#1	74.594 m	11.4 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.594	0.4	0.0	0.0
76.690	0.4	0.8	0.8
76.840	140.7	10.6	11.4

Device	Routing	Invert	Outlet Devices
#1	Primary	74.594 m	**100 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0306 m³/s @ 0.23 hrs HW=76.790 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0306 m³/s @ 3.89 m/s)

Pond 47P: CB04



Summary for Pond 49P: CBMH107

Inflow Area = 1,330.0 m²,100.00% Impervious, Inflow Depth = 30 mm for 100-Year event
Inflow = 0.0648 m³/s @ 0.17 hrs, Volume= 39.6 m³
Outflow = 0.0138 m³/s @ 0.30 hrs, Volume= 39.6 m³, Atten= 79%, Lag= 7.9 min
Primary = 0.0138 m³/s @ 0.30 hrs, Volume= 39.6 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 75.713 m @ 0.30 hrs Surf.Area= 234.3 m² Storage= 25.5 m³

Plug-Flow detention time= 15.9 min calculated for 39.4 m³ (100% of inflow)
Center-of-Mass det. time= 16.0 min (26.0 - 10.0)

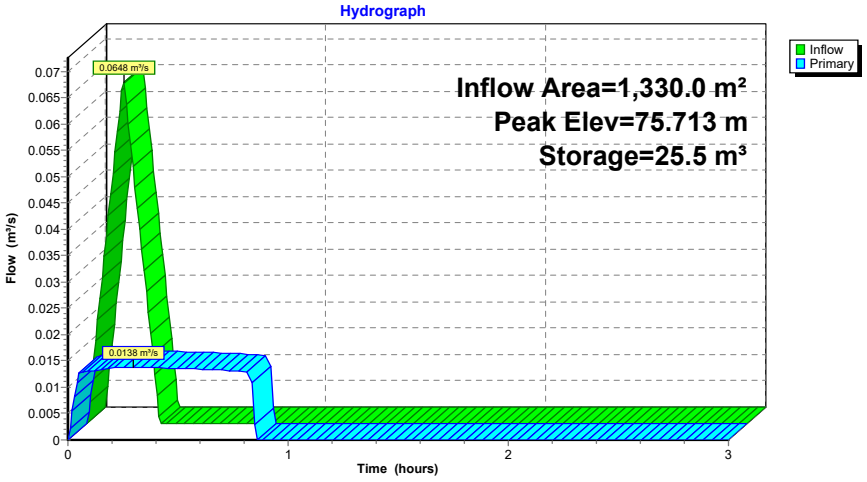
Volume	Invert	Avail.Storage	Storage Description
#1	74.297 m	50.0 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.297	0.4	0.0	0.0
75.500	0.4	0.5	0.5
75.800	330.0	49.6	50.0

Device	Routing	Invert	Outlet Devices
#1	Primary	74.297 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0138 m³/s @ 0.30 hrs HW=75.713 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0138 m³/s @ 3.12 m/s)

Pond 49P: CBMH107



Summary for Pond 51P: CB03

Inflow Area = 1,790.0 m², 100.00% Impervious, Inflow Depth = 30 mm for 100-Year event
Inflow = 0.0872 m³/s @ 0.17 hrs, Volume= 53.2 m³
Outflow = 0.0139 m³/s @ 0.31 hrs, Volume= 53.2 m³, Atten= 84%, Lag= 8.4 min
Primary = 0.0139 m³/s @ 0.31 hrs, Volume= 53.2 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 75.616 m @ 0.31 hrs Surf.Area= 455.7 m² Storage= 38.5 m³

Plug-Flow detention time= 23.7 min calculated for 53.1 m³ (100% of inflow)
Center-of-Mass det. time= 23.7 min (33.7 - 10.0)

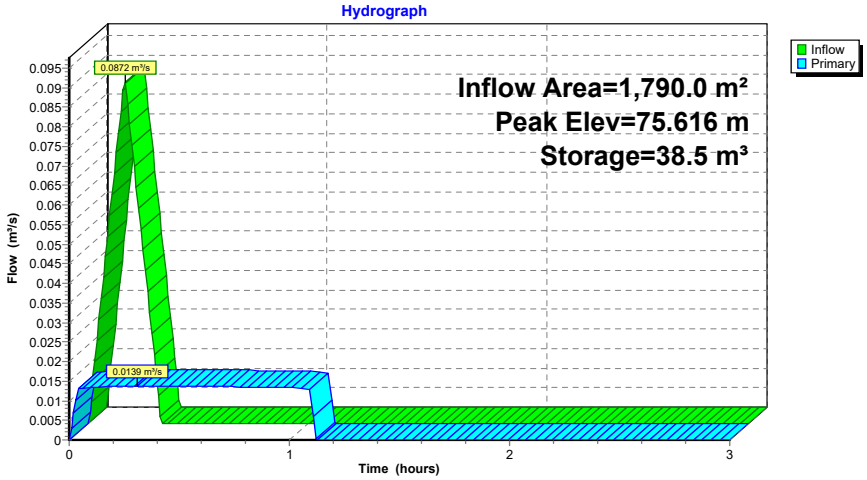
Volume	Invert	Avail.Storage	Storage Description
#1	74.183 m	123.7 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.183	0.4	0.0	0.0
75.450	0.4	0.5	0.5
75.750	821.0	123.2	123.7

Device	Routing	Invert	Outlet Devices
#1	Primary	74.183 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0139 m³/s @ 0.31 hrs HW=75.616 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0139 m³/s @ 3.14 m/s)

Pond 51P: CB03

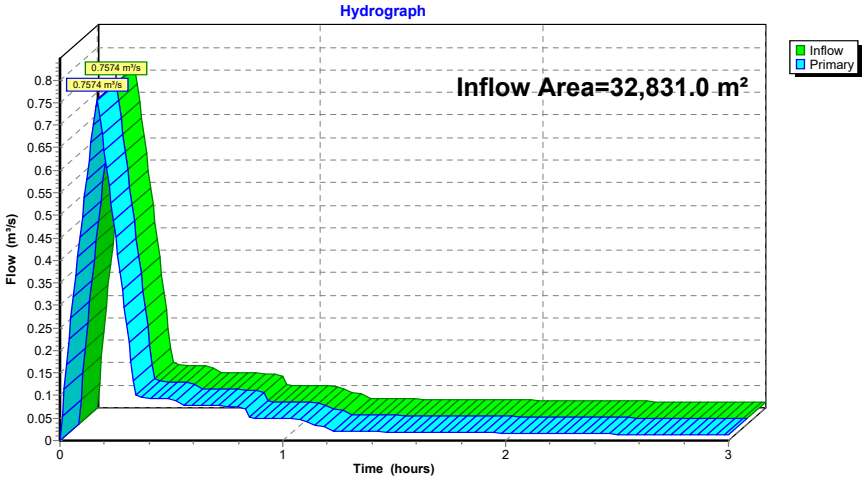


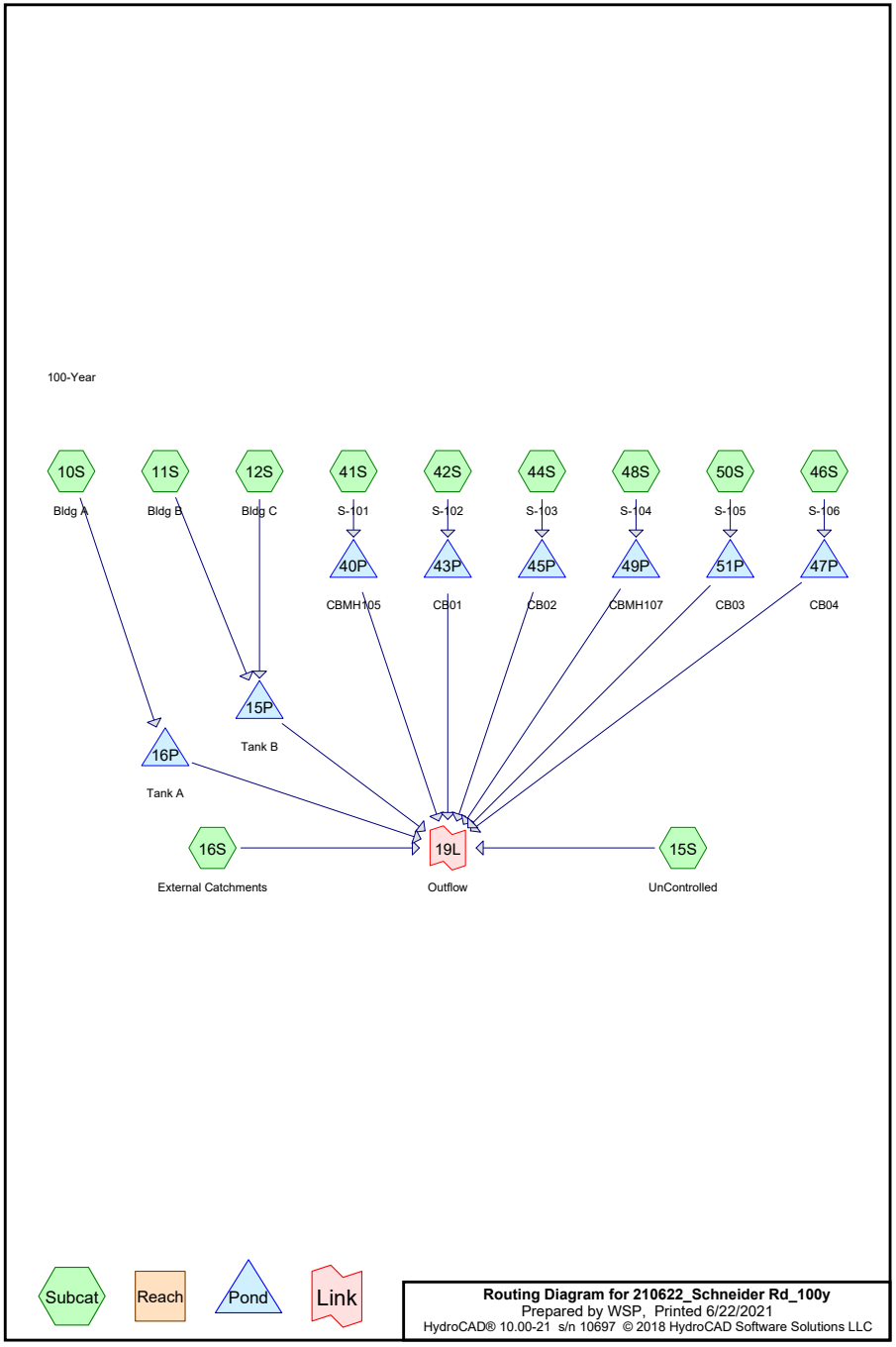
Summary for Link 19L: Outflow

Inflow Area = 32,831.0 m², 85.35% Impervious, Inflow Depth > 25 mm for 100-Year event
Inflow = 0.7574 m³/s @ 0.17 hrs, Volume= 831.5 m³
Primary = 0.7574 m³/s @ 0.17 hrs, Volume= 831.5 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 19L: Outflow





Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
8,471.0	1.00	(10S, 11S, 12S)
1,290.0	1.00	S-101 (41S)
1,960.0	1.00	S-102 (42S)
880.0	1.00	S-103 (44S)
1,330.0	1.00	S-104 (48S)
1,790.0	1.00	S-105 (50S)
1,020.0	1.00	S-106 (46S)
5,900.0	1.00	S-EXT1 (16S)
1,850.0	1.00	S-EXT2 (16S)
1,530.0	1.00	S-EXT3 (16S)
900.0	1.00	S-EXT4 (16S)
250.0	1.00	S-U1 (15S)
940.0	0.83	S-U2 (15S)
800.0	0.35	S-U3 (15S)
850.0	1.00	S-U4 (15S)
3,070.0	0.25	S-U5 (15S)
32,831.0	**0.91**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-meters)	Soil Group	Subcatchment Numbers
0.0	HSG A	
0.0	HSG B	
0.0	HSG C	
0.0	HSG D	
32,831.0	Other	10S, 11S, 12S, 15S, 16S, 41S, 42S, 44S, 46S, 48S, 50S
32,831.0		**TOTAL AREA**

Ground Covers (selected 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	Subca Numbe
0.0	0.0	0.0	0.0	8,471.0	8,471.0		
0.0	0.0	0.0	0.0	1,290.0	1,290.0	S-101	
0.0	0.0	0.0	0.0	1,960.0	1,960.0	S-102	
0.0	0.0	0.0	0.0	880.0	880.0	S-103	
0.0	0.0	0.0	0.0	1,330.0	1,330.0	S-104	
0.0	0.0	0.0	0.0	1,790.0	1,790.0	S-105	
0.0	0.0	0.0	0.0	1,020.0	1,020.0	S-106	
0.0	0.0	0.0	0.0	5,900.0	5,900.0	S-EXT1	
0.0	0.0	0.0	0.0	1,850.0	1,850.0	S-EXT2	
0.0	0.0	0.0	0.0	1,530.0	1,530.0	S-EXT3	
0.0	0.0	0.0	0.0	900.0	900.0	S-EXT4	
0.0	0.0	0.0	0.0	250.0	250.0	S-U1	
0.0	0.0	0.0	0.0	940.0	940.0	S-U2	
0.0	0.0	0.0	0.0	800.0	800.0	S-U3	
0.0	0.0	0.0	0.0	850.0	850.0	S-U4	
0.0	0.0	0.0	0.0	3,070.0	3,070.0	S-U5	
0.0	**0.0**	**0.0**	**0.0**	**32,831.0**	**32,831.0**	**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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment10S: Bldg A Runoff Area=0.4481 ha 100.00% Impervious Runoff Depth=62 mm
Tc=10.0 min C=1.00 Runoff=0.0512 m³/s 276.3 m³

Subcatchment11S: Bldg B Runoff Area=0.2380 ha 100.00% Impervious Runoff Depth=62 mm
Tc=10.0 min C=1.00 Runoff=0.0272 m³/s 146.8 m³

Subcatchment12S: Bldg C Runoff Area=0.1610 ha 100.00% Impervious Runoff Depth=62 mm
Tc=10.0 min C=1.00 Runoff=0.0184 m³/s 99.3 m³

Subcatchment15S: UnControlled Runoff Area=0.5910 ha 18.61% Impervious Runoff Depth=31 mm
Tc=10.0 min C=0.50 Runoff=0.0337 m³/s 182.2 m³

Subcatchment16S: External Runoff Area=1.0180 ha 100.00% Impervious Runoff Depth=62 mm
Tc=10.0 min C=1.00 Runoff=0.1163 m³/s 627.8 m³

Subcatchment41S: S-101 Runoff Area=0.1290 ha 100.00% Impervious Runoff Depth=62 mm
Tc=10.0 min C=1.00 Runoff=0.0147 m³/s 79.5 m³

Subcatchment42S: S-102 Runoff Area=0.1960 ha 100.00% Impervious Runoff Depth=62 mm
Tc=10.0 min C=1.00 Runoff=0.0224 m³/s 120.9 m³

Subcatchment44S: S-103 Runoff Area=0.0880 ha 100.00% Impervious Runoff Depth=62 mm
Tc=10.0 min C=1.00 Runoff=0.0100 m³/s 54.3 m³

Subcatchment46S: S-106 Runoff Area=0.1020 ha 100.00% Impervious Runoff Depth=62 mm
Tc=10.0 min C=1.00 Runoff=0.0116 m³/s 62.9 m³

Subcatchment48S: S-104 Runoff Area=0.1330 ha 100.00% Impervious Runoff Depth=62 mm
Tc=10.0 min C=1.00 Runoff=0.0152 m³/s 82.0 m³

Subcatchment50S: S-105 Runoff Area=0.1790 ha 100.00% Impervious Runoff Depth=62 mm
Tc=10.0 min C=1.00 Runoff=0.0204 m³/s 110.4 m³

Pond 15P: Tank B Peak Elev=1.844 m Storage=184.4 m³ Inflow=0.0456 m³/s 246.0 m³
Outflow=0.0158 m³/s 131.0 m³

Pond 16P: Tank A Peak Elev=2.103 m Storage=210.3 m³ Inflow=0.0512 m³/s 276.3 m³
Outflow=0.0169 m³/s 140.7 m³

Pond 40P: CBMH105 Peak Elev=76.061 m Storage=9.2 m³ Inflow=0.0147 m³/s 79.5 m³
Outflow=0.0131 m³/s 79.6 m³

Pond 43P: CB01 Peak Elev=76.115 m Storage=43.8 m³ Inflow=0.0224 m³/s 120.9 m³
Outflow=0.0140 m³/s 120.9 m³

Pond 45P: CB02 Peak Elev=75.166 m Storage=0.3 m³ Inflow=0.0100 m³/s 54.3 m³
Outflow=0.0100 m³/s 54.3 m³

Pond 47P: CB04 Peak Elev=74.955 m Storage=0.1 m³ Inflow=0.0116 m³/s 62.9 m³
Outflow=0.0116 m³/s 62.9 m³

Pond 49P: CBMH107 Peak Elev=75.634 m Storage=10.3 m³ Inflow=0.0152 m³/s 82.0 m³
Outflow=0.0134 m³/s 82.0 m³

Pond 51P: CB03 Peak Elev=75.608 m Storage=34.8 m³ Inflow=0.0204 m³/s 110.4 m³
Outflow=0.0138 m³/s 110.4 m³

Link 19L: Outflow Inflow=0.2581 m³/s 1,591.6 m³
Primary=0.2581 m³/s 1,591.6 m³

Total Runoff Area = 32,831.0 m² Runoff Volume = 1,842.3 m³ Average Runoff Depth = 56 mm
14.65% Pervious = 4,810.0 m² 85.35% Impervious = 28,021.0 m²

Summary for Subcatchment 10S: Bldg A

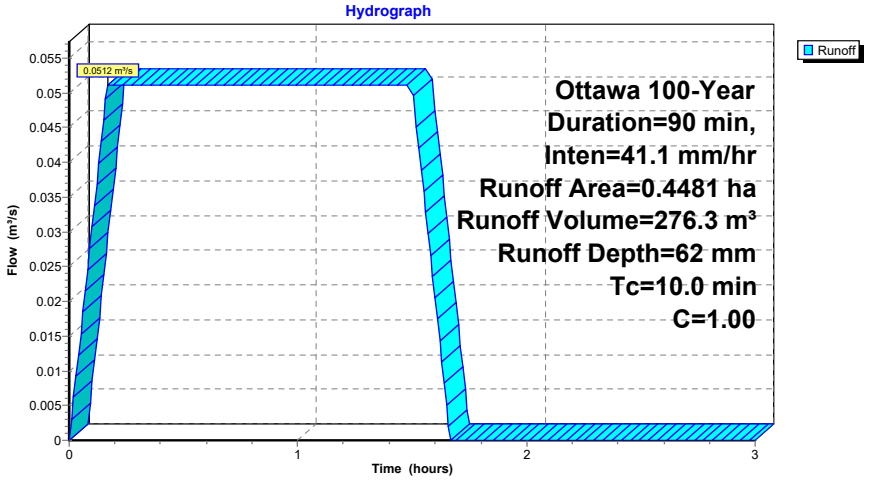
Runoff = 0.0512 m³/s @ 0.17 hrs, Volume= 276.3 m³, Depth= 62 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.4481	1.00	
0.4481		100.00% Impervious Area

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

Subcatchment 10S: Bldg A



Summary for Subcatchment 11S: Bldg B

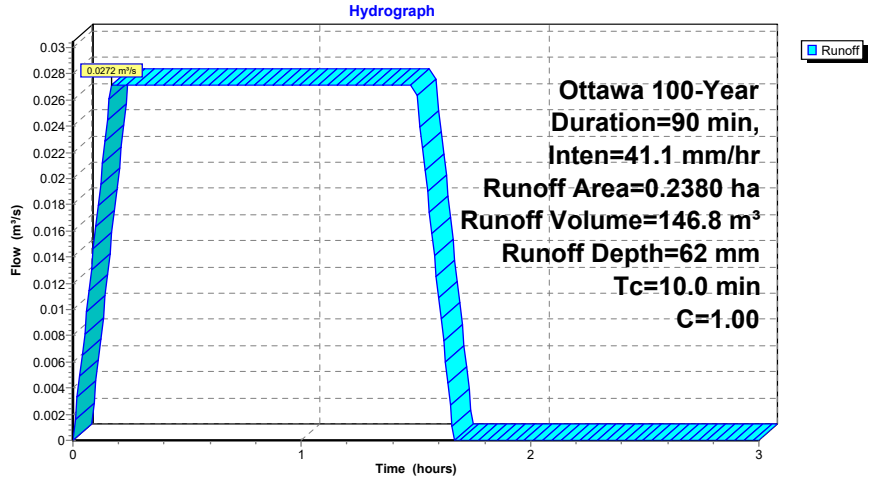
Runoff = 0.0272 m³/s @ 0.17 hrs, Volume= 146.8 m³, Depth= 62 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.2380	1.00	
0.2380		100.00% Impervious Area

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

Subcatchment 11S: Bldg B



Summary for Subcatchment 12S: Bldg C

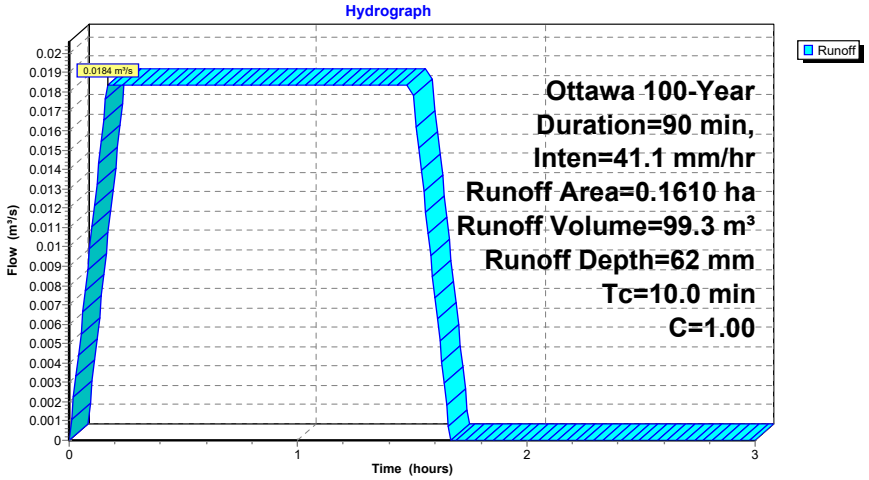
Runoff = 0.0184 m³/s @ 0.17 hrs, Volume= 99.3 m³, Depth= 62 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.1610	1.00	
0.1610		100.00% Impervious Area

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

Subcatchment 12S: Bldg C



Summary for Subcatchment 15S: UnControlled

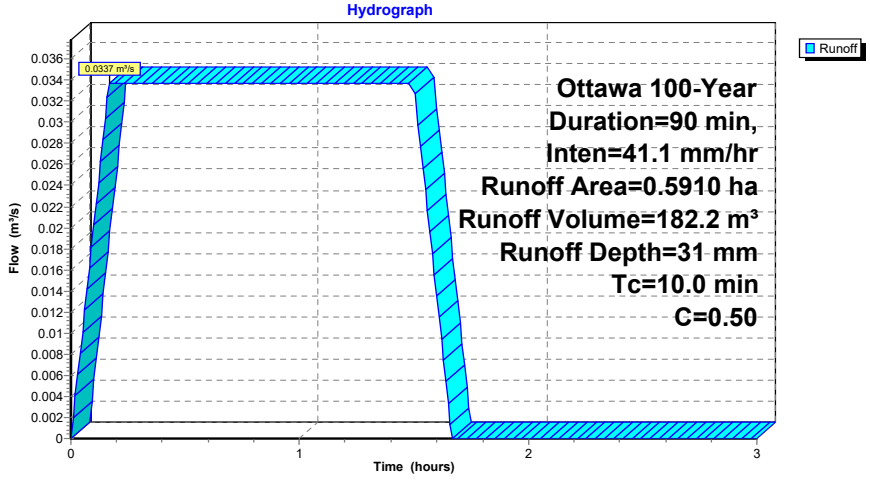
Runoff = 0.0337 m³/s @ 0.17 hrs, Volume= 182.2 m³, Depth= 31 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.0250	1.00	S-U1
0.0940	0.83	S-U2
0.0800	0.35	S-U3
0.0850	1.00	S-U4
0.3070	0.25	S-U5
0.5910	0.50	Weighted Average
0.4810		81.39% Pervious Area
0.1100		18.61% Impervious Area

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

Subcatchment 15S: UnControlled



Summary for Subcatchment 16S: External Catchments

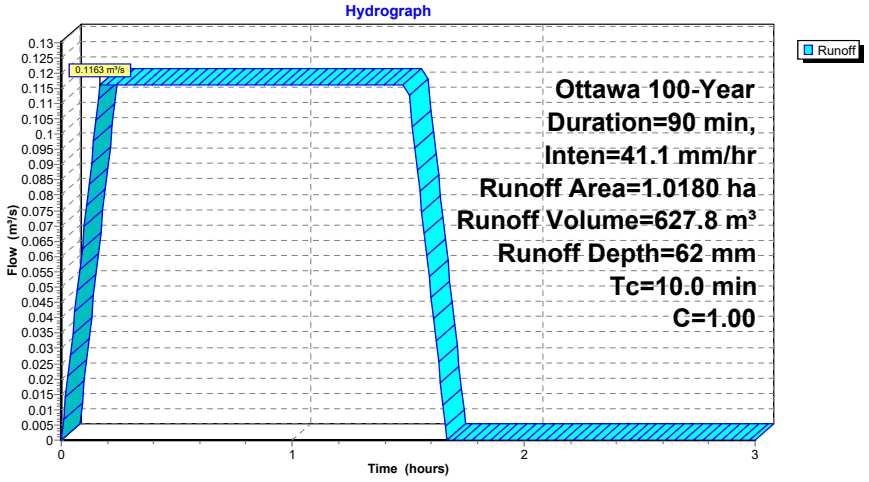
Runoff = 0.1163 m³/s @ 0.17 hrs, Volume= 627.8 m³, Depth= 62 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.5900	1.00	S-EXT1
0.1850	1.00	S-EXT2
0.1530	1.00	S-EXT3
0.0900	1.00	S-EXT4
1.0180	1.00	Weighted Average
1.0180		100.00% Impervious Area

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

Subcatchment 16S: External Catchments



Summary for Subcatchment 41S: S-101

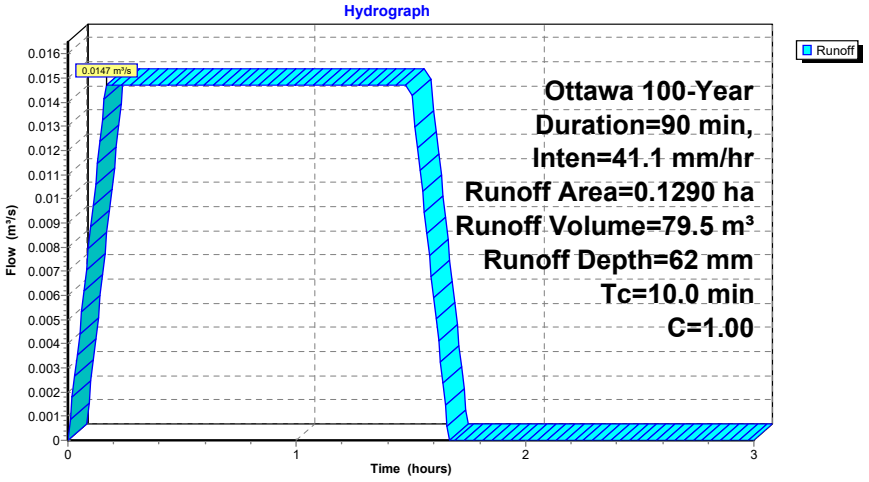
Runoff = 0.0147 m³/s @ 0.17 hrs, Volume= 79.5 m³, Depth= 62 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.1290	1.00	S-101
0.1290		100.00% Impervious Area

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

Subcatchment 41S: S-101



Summary for Subcatchment 42S: S-102

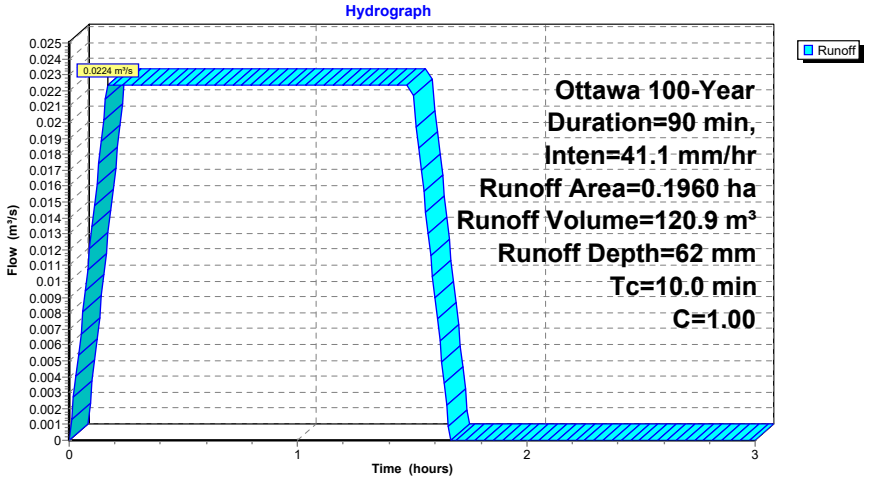
Runoff = 0.0224 m³/s @ 0.17 hrs, Volume= 120.9 m³, Depth= 62 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.1960	1.00	S-102
0.1960		100.00% Impervious Area

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

Subcatchment 42S: S-102



Summary for Subcatchment 44S: S-103

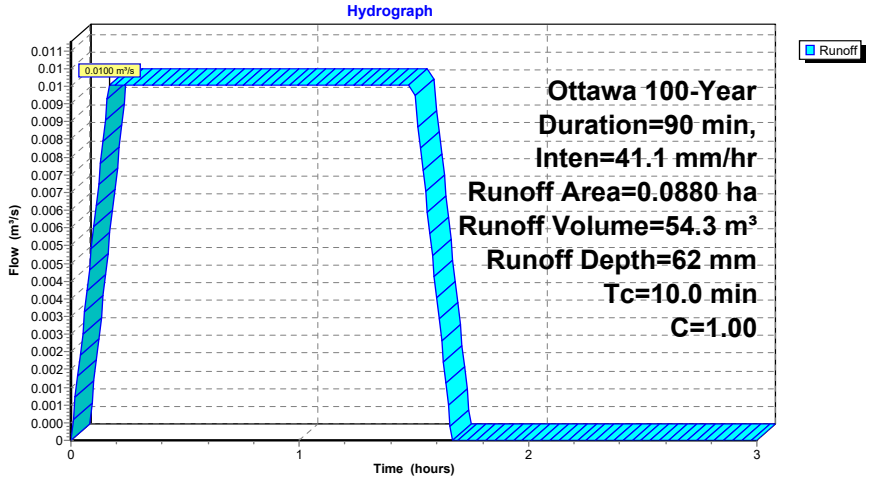
Runoff = 0.0100 m³/s @ 0.17 hrs, Volume= 54.3 m³, Depth= 62 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.0880	1.00	S-103
0.0880		100.00% Impervious Area

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

Subcatchment 44S: S-103



Summary for Subcatchment 46S: S-106

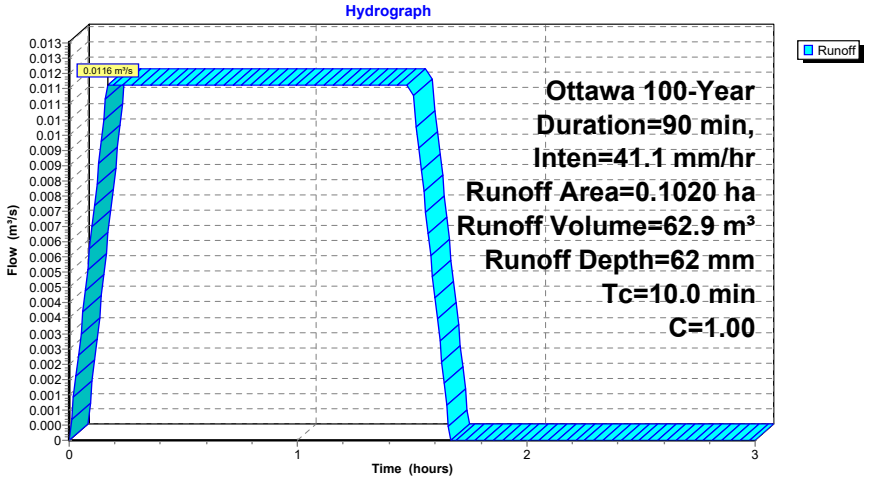
Runoff = 0.0116 m³/s @ 0.17 hrs, Volume= 62.9 m³, Depth= 62 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.1020	1.00	S-106
0.1020		100.00% Impervious Area

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

Subcatchment 46S: S-106



Summary for Subcatchment 48S: S-104

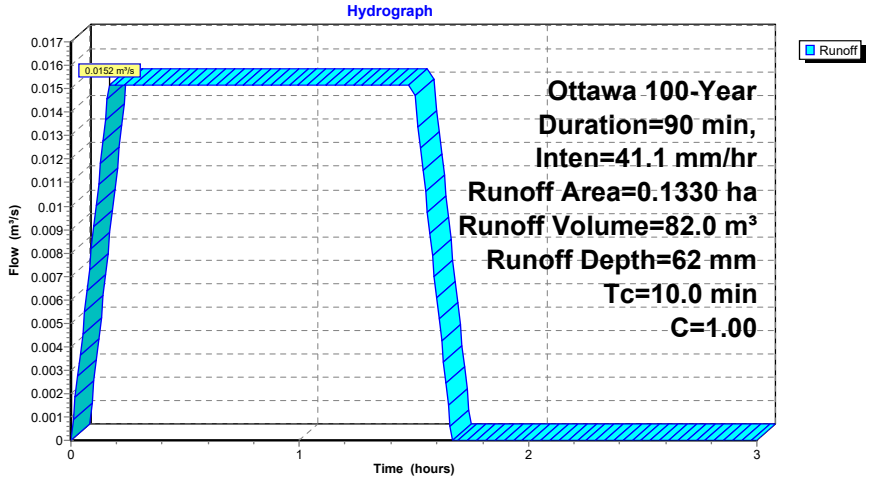
Runoff = 0.0152 m³/s @ 0.17 hrs, Volume= 82.0 m³, Depth= 62 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.1330	1.00	S-104
0.1330		100.00% Impervious Area

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

Subcatchment 48S: S-104



Summary for Subcatchment 50S: S-105

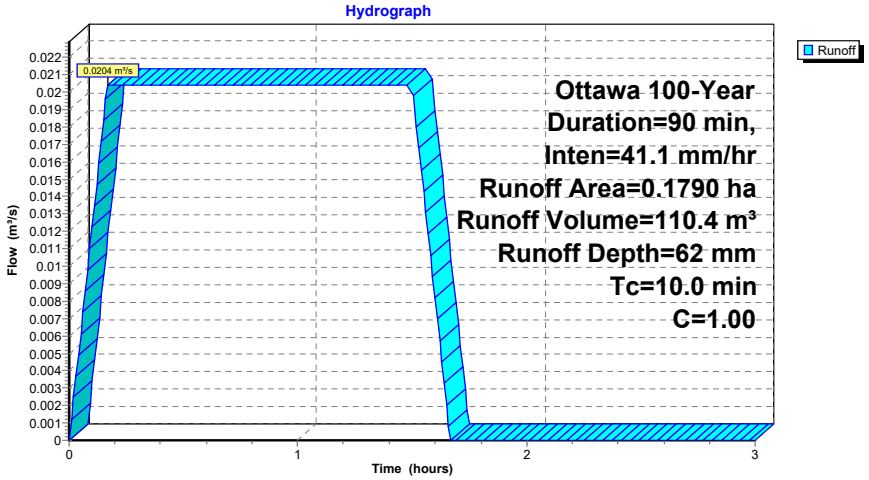
Runoff = 0.0204 m³/s @ 0.17 hrs, Volume= 110.4 m³, Depth= 62 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=90 min, Inten=41.1 mm/hr

Area (ha)	C	Description
0.1790	1.00	S-105
0.1790		100.00% Impervious Area

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

Subcatchment 50S: S-105



Summary for Pond 15P: Tank B

Inflow Area = 3,990.0 m², 100.00% Impervious, Inflow Depth = 62 mm for 100-Year event
Inflow = 0.0456 m³/s @ 0.17 hrs, Volume= 246.0 m³
Outflow = 0.0158 m³/s @ 1.61 hrs, Volume= 131.0 m³, Atten= 65%, Lag= 86.3 min
Primary = 0.0158 m³/s @ 1.61 hrs, Volume= 131.0 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 1.844 m @ 1.61 hrs Surf.Area= 100.0 m² Storage= 184.4 m³

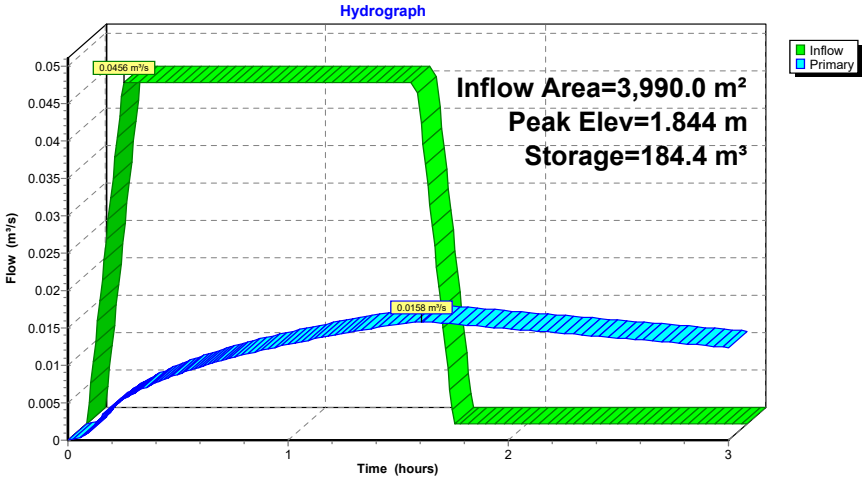
Plug-Flow detention time= 72.3 min calculated for 130.6 m³ (53% of inflow)
Center-of-Mass det. time= 51.4 min (101.4 - 50.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	400.0 m³	**10.00 mW x 10.00 mL x 4.00 mH Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.000 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0158 m³/s @ 1.61 hrs HW=1.843 m (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.0158 m³/s @ 3.57 m/s)

Pond 15P: Tank B



Summary for Pond 16P: Tank A

Inflow Area = 4,481.0 m², 100.00% Impervious, Inflow Depth = 62 mm for 100-Year event
Inflow = 0.0512 m³/s @ 0.17 hrs, Volume= 276.3 m³
Outflow = 0.0169 m³/s @ 1.61 hrs, Volume= 140.7 m³, Atten= 67%, Lag= 86.5 min
Primary = 0.0169 m³/s @ 1.61 hrs, Volume= 140.7 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 2.103 m @ 1.61 hrs Surf.Area= 100.0 m² Storage= 210.3 m³

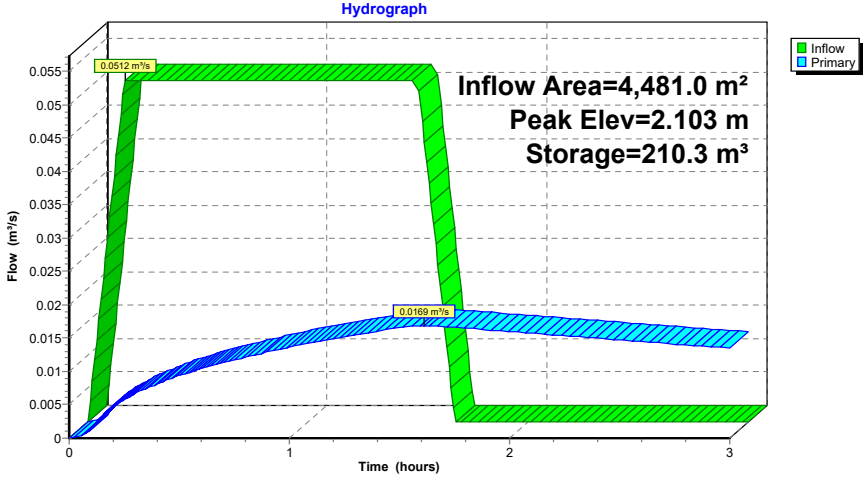
Plug-Flow detention time= 73.8 min calculated for 140.7 m³ (51% of inflow)
Center-of-Mass det. time= 51.6 min (101.6 - 50.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	400.0 m³	**10.00 mW x 10.00 mL x 4.00 mH Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.000 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0169 m³/s @ 1.61 hrs HW=2.103 m (Free Discharge)
↳**1=Orifice/Grate** (Orifice Controls 0.0169 m³/s @ 3.82 m/s)

Pond 16P: Tank A



Summary for Pond 40P: CBMH105

Inflow Area = 1,290.0 m², 100.00% Impervious, Inflow Depth = 62 mm for 100-Year event
Inflow = 0.0147 m³/s @ 0.17 hrs, Volume= 79.5 m³
Outflow = 0.0131 m³/s @ 1.52 hrs, Volume= 79.6 m³, Atten= 11%, Lag= 80.9 min
Primary = 0.0131 m³/s @ 1.52 hrs, Volume= 79.6 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 76.061 m @ 1.52 hrs Surf.Area= 157.7 m² Storage= 9.2 m³

Plug-Flow detention time= 6.4 min calculated for 79.3 m³ (100% of inflow)
Center-of-Mass det. time= 6.4 min (56.4 - 50.0)

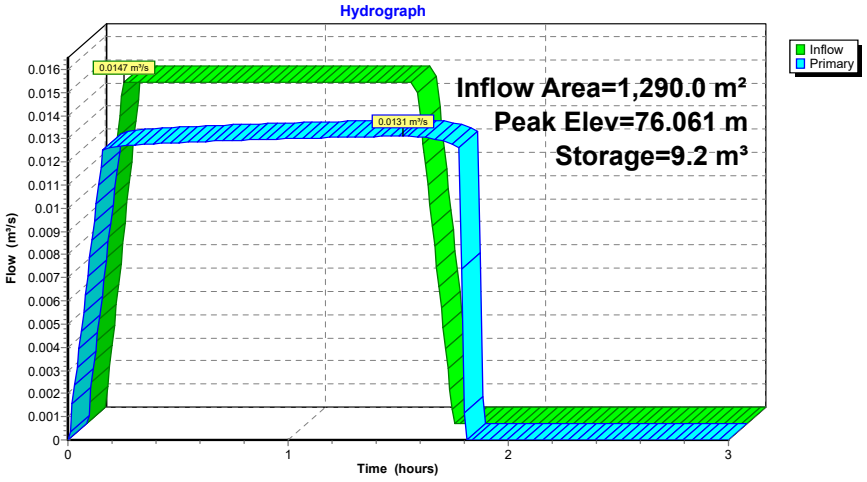
Volume	Invert	Avail.Storage	Storage Description
#1	74.776 m	64.6 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.776	0.4	0.0	0.0
75.950	0.4	0.5	0.5
76.250	427.0	64.1	64.6

Device	Routing	Invert	Outlet Devices
#1	Primary	74.776 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0131 m³/s @ 1.52 hrs HW=76.061 m (Free Discharge)
↳**1=Orifice/Grate** (Orifice Controls 0.0131 m³/s @ 2.97 m/s)

Pond 40P: CBMH105



Summary for Pond 43P: CB01

Inflow Area = 1,960.0 m², 100.00% Impervious, Inflow Depth = 62 mm for 100-Year event
Inflow = 0.0224 m³/s @ 0.17 hrs, Volume= 120.9 m³
Outflow = 0.0140 m³/s @ 1.56 hrs, Volume= 120.9 m³, Atten= 37%, Lag= 83.5 min
Primary = 0.0140 m³/s @ 1.56 hrs, Volume= 120.9 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 76.115 m @ 1.56 hrs Surf.Area= 525.1 m² Storage= 43.8 m³

Plug-Flow detention time= 26.9 min calculated for 120.5 m³ (100% of inflow)
Center-of-Mass det. time= 27.0 min (77.0 - 50.0)

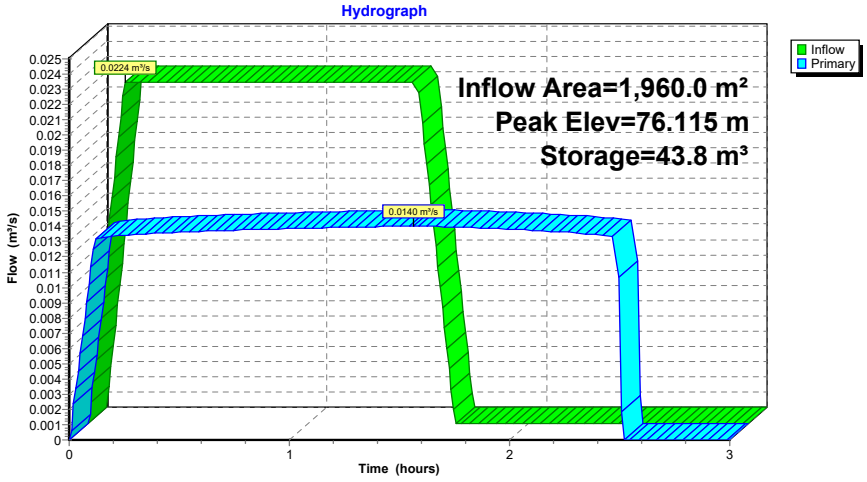
Volume	Invert	Avail.Storage	Storage Description
#1	74.651 m	144.0 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.651	0.4	0.0	0.0
75.950	0.4	0.5	0.5
76.250	956.0	143.5	144.0

Device	Routing	Invert	Outlet Devices
#1	Primary	74.651 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0140 m³/s @ 1.56 hrs HW=76.115 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0140 m³/s @ 3.17 m/s)

Pond 43P: CB01



Summary for Pond 45P: CB02

Inflow Area = 880.0 m², 100.00% Impervious, Inflow Depth = 62 mm for 100-Year event
Inflow = 0.0100 m³/s @ 0.17 hrs, Volume= 54.3 m³
Outflow = 0.0100 m³/s @ 0.71 hrs, Volume= 54.3 m³, Atten= 0%, Lag= 32.4 min
Primary = 0.0100 m³/s @ 0.71 hrs, Volume= 54.3 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 75.166 m @ 0.64 hrs Surf.Area= 0.4 m² Storage= 0.3 m³

Plug-Flow detention time= 0.5 min calculated for 54.1 m³ (100% of inflow)
Center-of-Mass det. time= 0.5 min (50.5 - 50.0)

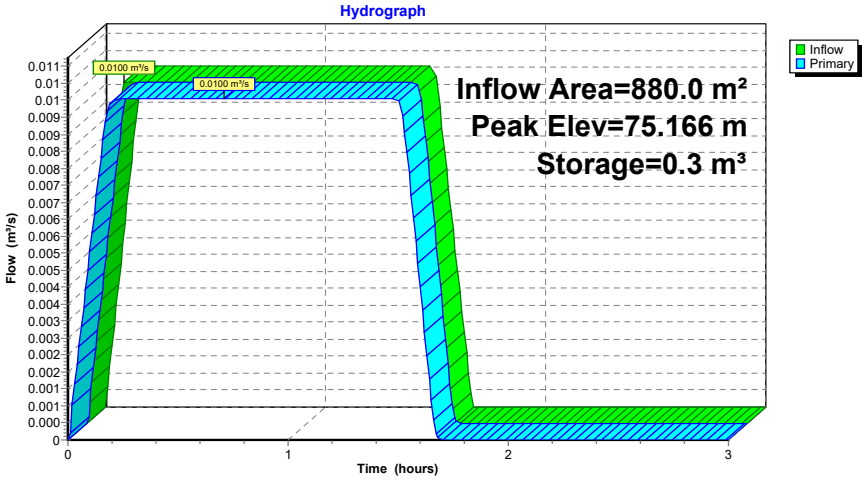
Volume	Invert	Avail.Storage	Storage Description
#1	74.396 m	18.1 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.396	0.4	0.0	0.0
75.950	0.4	0.6	0.6
76.150	174.0	17.4	18.1

Device	Routing	Invert	Outlet Devices
#1	Primary	74.396 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0100 m³/s @ 0.71 hrs HW=75.166 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0100 m³/s @ 2.27 m/s)

Pond 45P: CB02



Summary for Pond 47P: CB04

Inflow Area = 1,020.0 m²,100.00% Impervious, Inflow Depth = 62 mm for 100-Year event
Inflow = 0.0116 m³/s @ 0.17 hrs, Volume= 62.9 m³
Outflow = 0.0116 m³/s @ 0.32 hrs, Volume= 62.9 m³, Atten= 0%, Lag= 9.0 min
Primary = 0.0116 m³/s @ 0.32 hrs, Volume= 62.9 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 74.955 m @ 0.29 hrs Surf.Area= 0.4 m² Storage= 0.1 m³

Plug-Flow detention time= 0.2 min calculated for 62.7 m³ (100% of inflow)
Center-of-Mass det. time= 0.2 min (50.2 - 50.0)

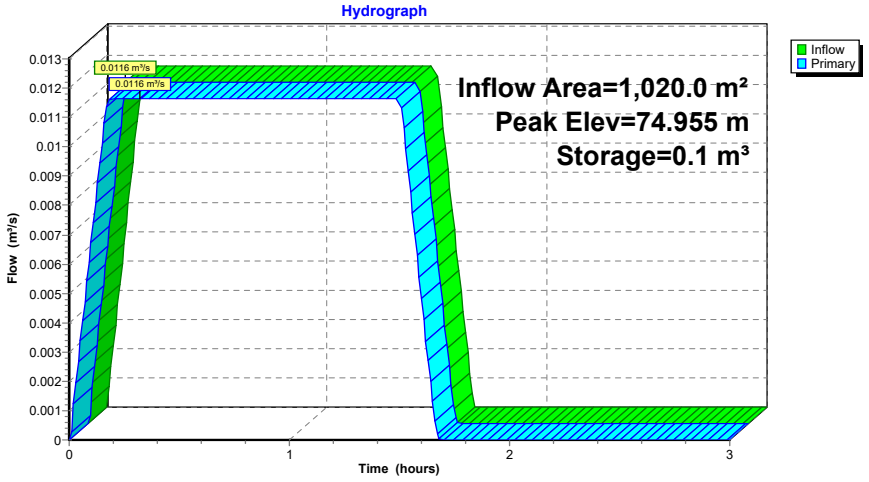
Volume	Invert	Avail.Storage	Storage Description
#1	74.594 m	11.4 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.594	0.4	0.0	0.0
76.690	0.4	0.8	0.8
76.840	140.7	10.6	11.4

Device	Routing	Invert	Outlet Devices
#1	Primary	74.594 m	**100 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0116 m³/s @ 0.32 hrs HW=74.955 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0116 m³/s @ 1.48 m/s)

Pond 47P: CB04



Summary for Pond 49P: CBMH107

Inflow Area = 1,330.0 m²,100.00% Impervious, Inflow Depth = 62 mm for 100-Year event
Inflow = 0.0152 m³/s @ 0.17 hrs, Volume= 82.0 m³
Outflow = 0.0134 m³/s @ 1.52 hrs, Volume= 82.0 m³, Atten= 12%, Lag= 81.0 min
Primary = 0.0134 m³/s @ 1.52 hrs, Volume= 82.0 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 75.634 m @ 1.52 hrs Surf.Area= 147.1 m² Storage= 10.3 m³

Plug-Flow detention time= 7.0 min calculated for 81.8 m³ (100% of inflow)
Center-of-Mass det. time= 7.0 min (57.0 - 50.0)

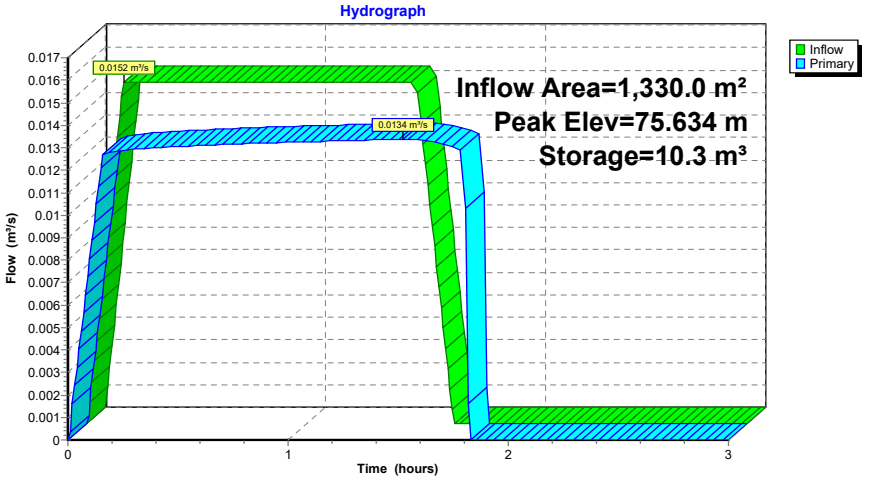
Volume	Invert	Avail.Storage	Storage Description
#1	74.297 m	50.0 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.297	0.4	0.0	0.0
75.500	0.4	0.5	0.5
75.800	330.0	49.6	50.0

Device	Routing	Invert	Outlet Devices
#1	Primary	74.297 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0134 m³/s @ 1.52 hrs HW=75.634 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0134 m³/s @ 3.03 m/s)

Pond 49P: CBMH107



Summary for Pond 51P: CB03

Inflow Area = 1,790.0 m², 100.00% Impervious, Inflow Depth = 62 mm for 100-Year event
Inflow = 0.0204 m³/s @ 0.17 hrs, Volume= 110.4 m³
Outflow = 0.0138 m³/s @ 1.55 hrs, Volume= 110.4 m³, Atten= 32%, Lag= 83.0 min
Primary = 0.0138 m³/s @ 1.55 hrs, Volume= 110.4 m³

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 75.608 m @ 1.55 hrs Surf.Area= 433.3 m² Storage= 34.8 m³

Plug-Flow detention time= 21.8 min calculated for 110.0 m³ (100% of inflow)
Center-of-Mass det. time= 21.8 min (71.8 - 50.0)

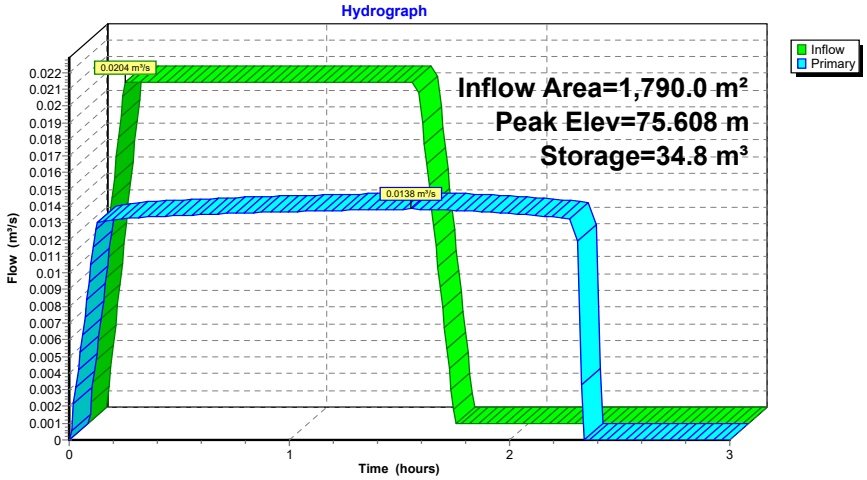
Volume	Invert	Avail.Storage	Storage Description
#1	74.183 m	123.7 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
74.183	0.4	0.0	0.0
75.450	0.4	0.5	0.5
75.750	821.0	123.2	123.7

Device	Routing	Invert	Outlet Devices
#1	Primary	74.183 m	**75 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0138 m³/s @ 1.55 hrs HW=75.608 m (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.0138 m³/s @ 3.13 m/s)

Pond 51P: CB03

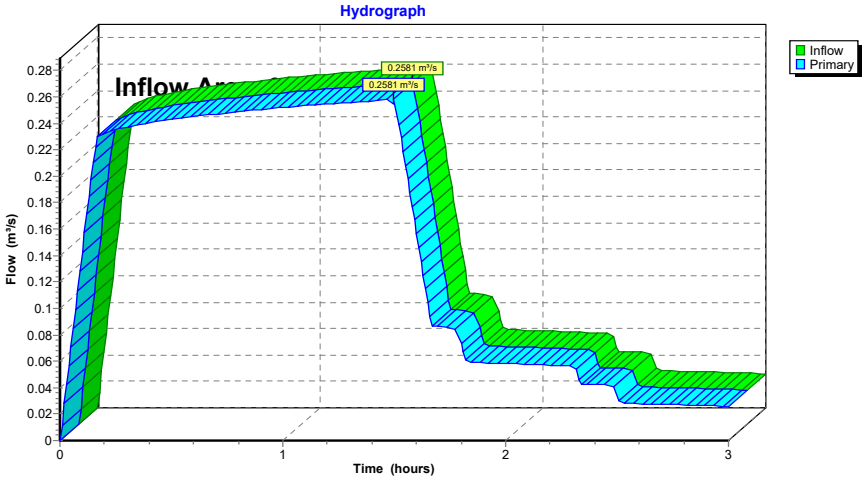


Summary for Link 19L: Outflow

Inflow Area = 32,831.0 m², 85.35% Impervious, Inflow Depth > 48 mm for 100-Year event
Inflow = 0.2581 m³/s @ 1.50 hrs, Volume= 1,591.6 m³
Primary = 0.2581 m³/s @ 1.50 hrs, Volume= 1,591.6 m³, Atten= 0%, Lag= 0.0 min

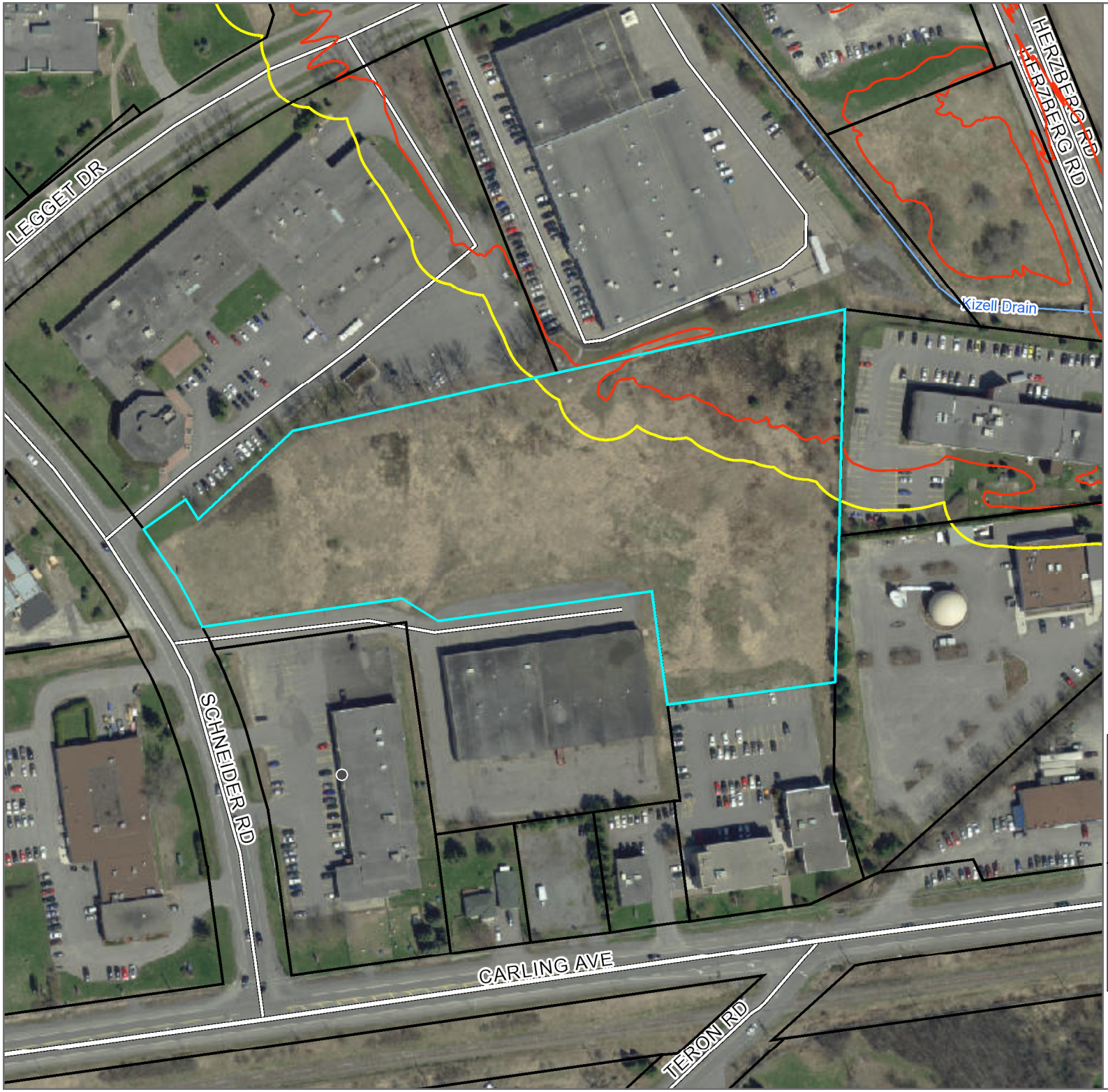
Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 19L: Outflow



APPENDIX

C MVCA FLOODPLAIN MAP



Mississippi Valley Conservation Authority

Ontario Regulation 153/06

103 Schneider Road

Legend

- Parcels - Assessment
- 1:100 yr Flood Plain
- MVCA Regulation Limit
- MVCA Streams

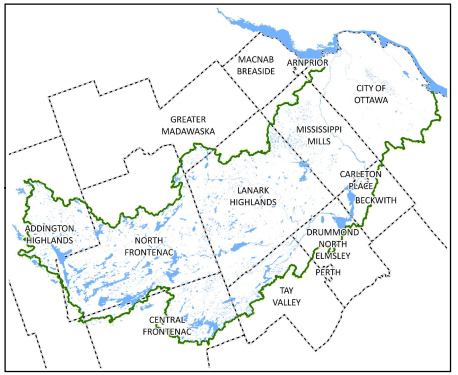
0 0.04 0.08

km

1:2,000

N W E S

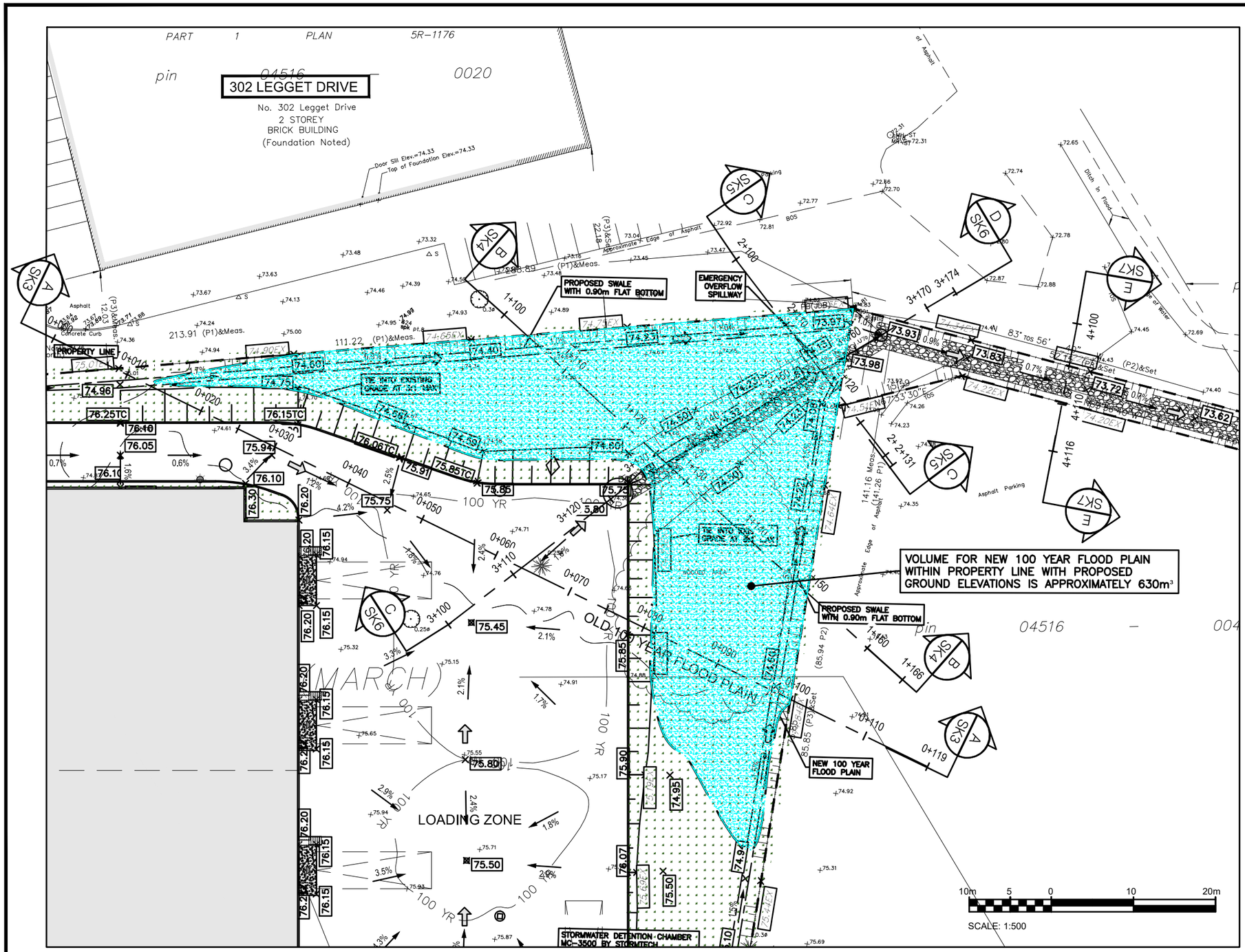
Projection: UTM Zone 18- NAD 83 Datum



Date: 12/11/2020

APPENDIX

D CUT AND FILL ANALYSIS



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WWW.WSP.COM

CLIENT:

RENFROE LAND MANAGEMENT

CLIENT REF. #:

PROJECT:

103 SCHNEIDER ROAD

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021/06/23	ISSUE FOR SPA

PROJECT NO:	DATE:
211-01794-00	JUNE 2021
ORIGINAL SCALE: 1:500	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: D.Y.	
DRAWN BY: J.T.	
CHECKED BY: D.Y./I.J.	25mm

DISCIPLINE: CIVIL

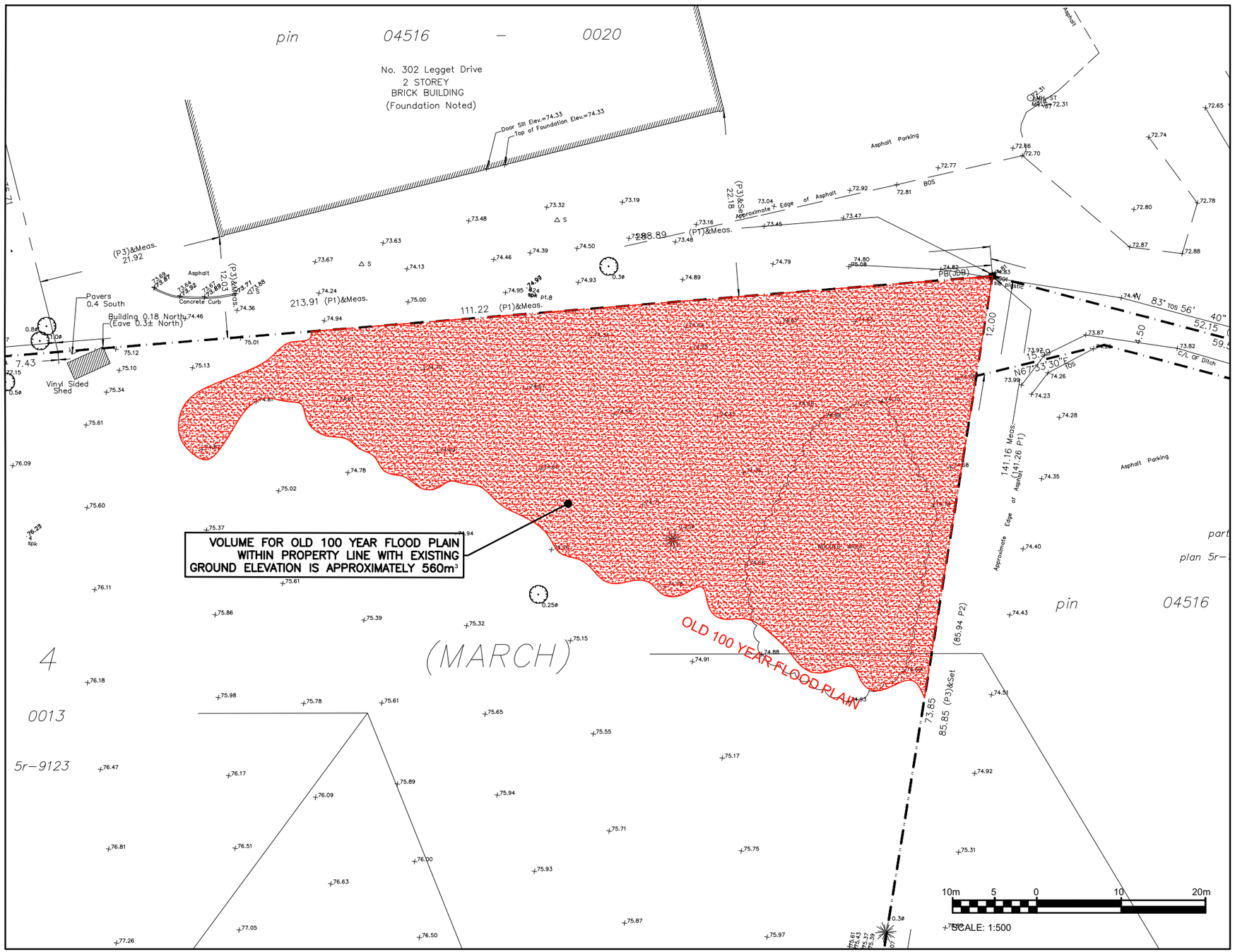
TITLE: NEW 100 YEAR FLOOD PLAIN VOLUME

SHEET NUMBER: SK1

SHEET #: 1 OF 1

ISSUE: ISSUED FOR SPA
DATE OF: 2021/06/23

REV # 0



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CLIENT:

RENFROE LAND MANAGEMENT

CLIENT REF. #:

PROJECT:

103 SCHNEIDER ROAD

ISSUED FOR - REVISION:

1		2021/06/23	ISSUE FOR SPA
IS	RE	DATE	DESCRIPTION

PROJECT NO: 211-01794-00	DATE: JUNE 2021
ORIGINAL SCALE: 1:500	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: D.Y.	
DRAWN BY: J.T.	
CHECKED BY: D.Y./I.J.	25mm

DISCIPLINE: CIVIL

TITLE: OLD 100 YEAR FLOOD PLAIN VOLUME

SHEET NUMBER: SK2

SHEET #: 1 OF 2

ISSUE:	REV #
ISSUED FOR SPA DATE OF: 2021/06/23	0

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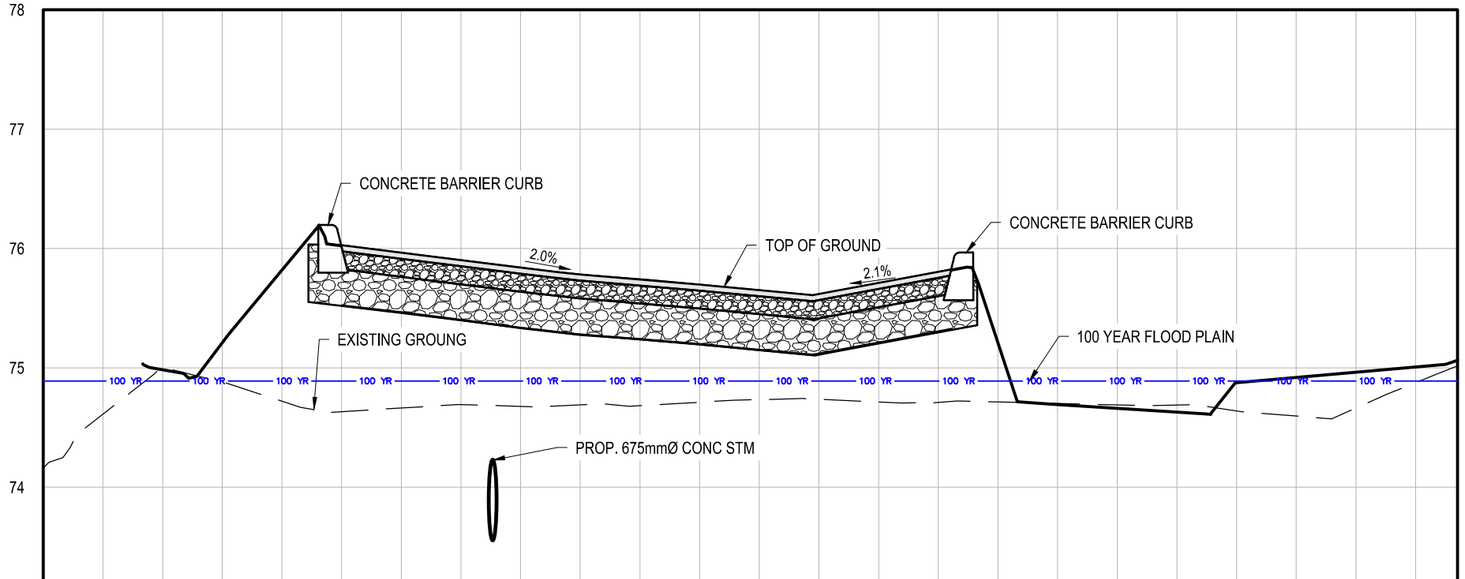

STATION			0+010	0+020	0+030	0+040	0+050	0+060	0+070	0+080	0+090	0+100	0+110	0+119		STATION
CENTERLINE GRADE	FINISHED	74.16	75.00	75.00	74.72	74.66	74.68	74.68	74.68	74.73	74.71	74.71	74.71	74.69	74.64	74.66	75.02	75.02	FINISHED	CENTERLINE GRADE
	EXISTING	74.16	74.16	74.72	74.72	74.66	74.66	74.68	74.68	74.68	74.73	74.73	74.71	74.71	74.71	74.69	74.69	74.64	74.64	74.66	74.66	75.02	EXISTING	

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RENFROE LAND MANAGEMENT

CLIENT REF. #:

PROJECT:

103 SCHNEIDER ROAD

ISSUED FOR - REVISION:

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PROJECT NO: 211-01794-00

DATE: JUNE 2021

ORIGINAL SCALE: 1:500

DESIGNED BY: D.Y.

DRAWN BY: J.T.

CHECKED BY: D.Y./I.J.

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

DISCIPLINE: CIVIL

TITLE: CROSS SECTION A-A

SHEET NUMBER: SK3

SHEET #: 1 OF 3

ISSUE: ISSUED FOR SPA

DATE OF: 2021/06/23

REV # 0

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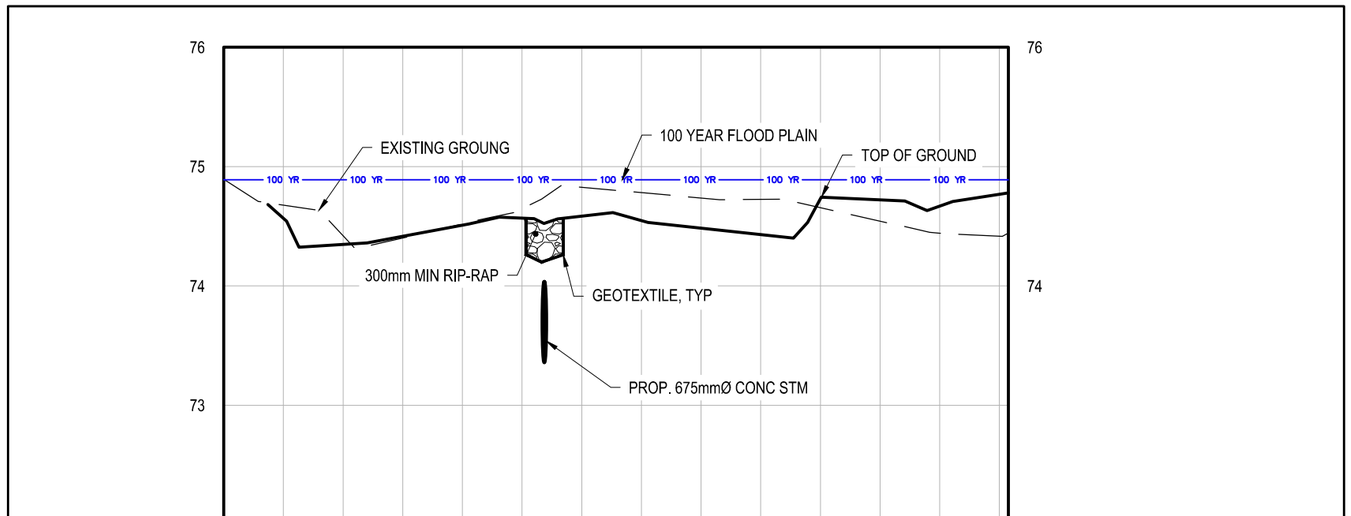

STATION		1+110	1+120	1+130	1+140	1+150	1+160	1+166	STATION
CENTERLINE GRADE FINISHED		74.89	74.42	74.52	74.83	74.74	74.66	74.44	CENTERLINE GRADE
CENTERLINE GRADE EXISTING	74.89	74.89	74.42	74.52	74.83	74.74	74.66	74.44	CENTERLINE GRADE

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DATE: JUNE 2021

ORIGINAL SCALE: 1:500

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25mm

DESIGNED BY: D.Y.

DRAWN BY: J.T.

CHECKED BY: D.Y./I.J.

DISCIPLINE: CIVIL

TITLE: CROSS SECTION B-B

SHEET NUMBER: SK4

SHEET #: 1 OF 4

ISSUE: ISSUED FOR SPA
DATE OF: 2021/06/23

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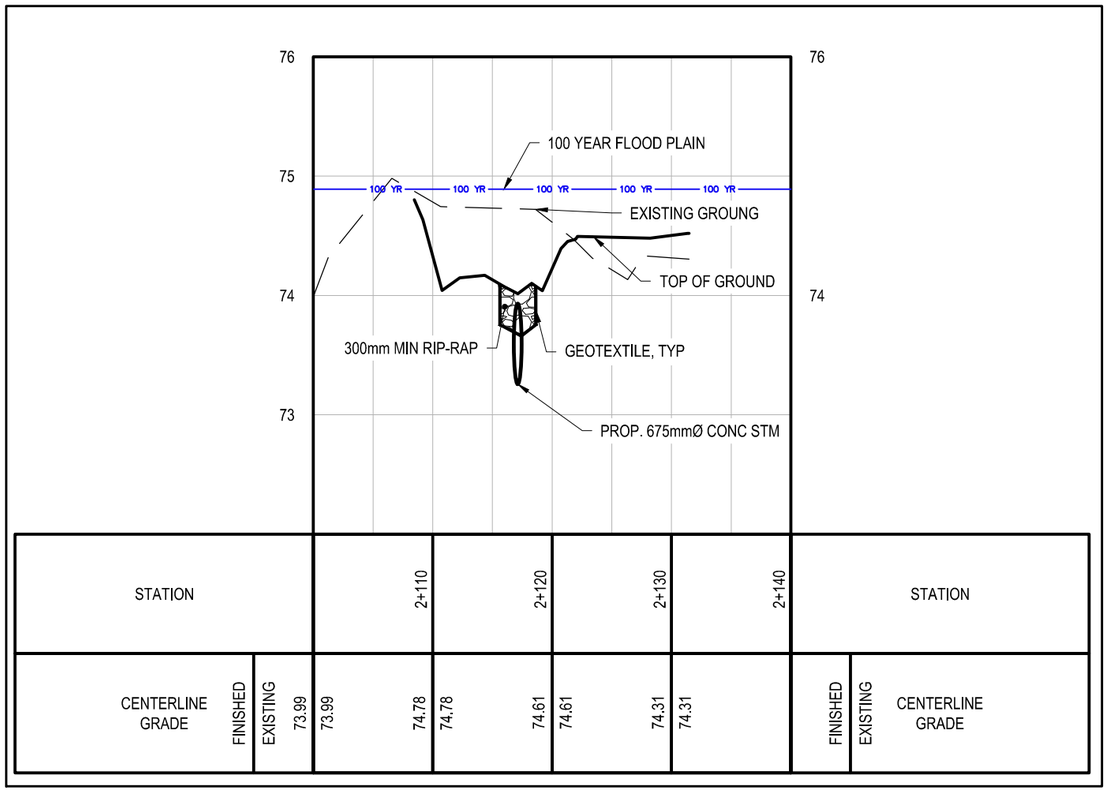

STATION			2+110	2+120	2+130	2+140	STATION
CENTERLINE GRADE	FINISHED	73.99	73.99	74.78	74.61	74.31	
	EXISTING	73.99	73.99	74.78	74.61	74.31	CENTERLINE GRADE

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PROJECT NO: 211-01794-00

DATE: JUNE 2021

ORIGINAL SCALE: 1:500

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25mm

DESIGNED BY: D.Y.

DRAWN BY: J.T.

CHECKED BY: D.Y./I.J.

DISCIPLINE: CIVIL

TITLE: CROSS SECTION C-C

SHEET NUMBER: SK5

SHEET #: 1 OF 5

ISSUE: ISSUED FOR SPA

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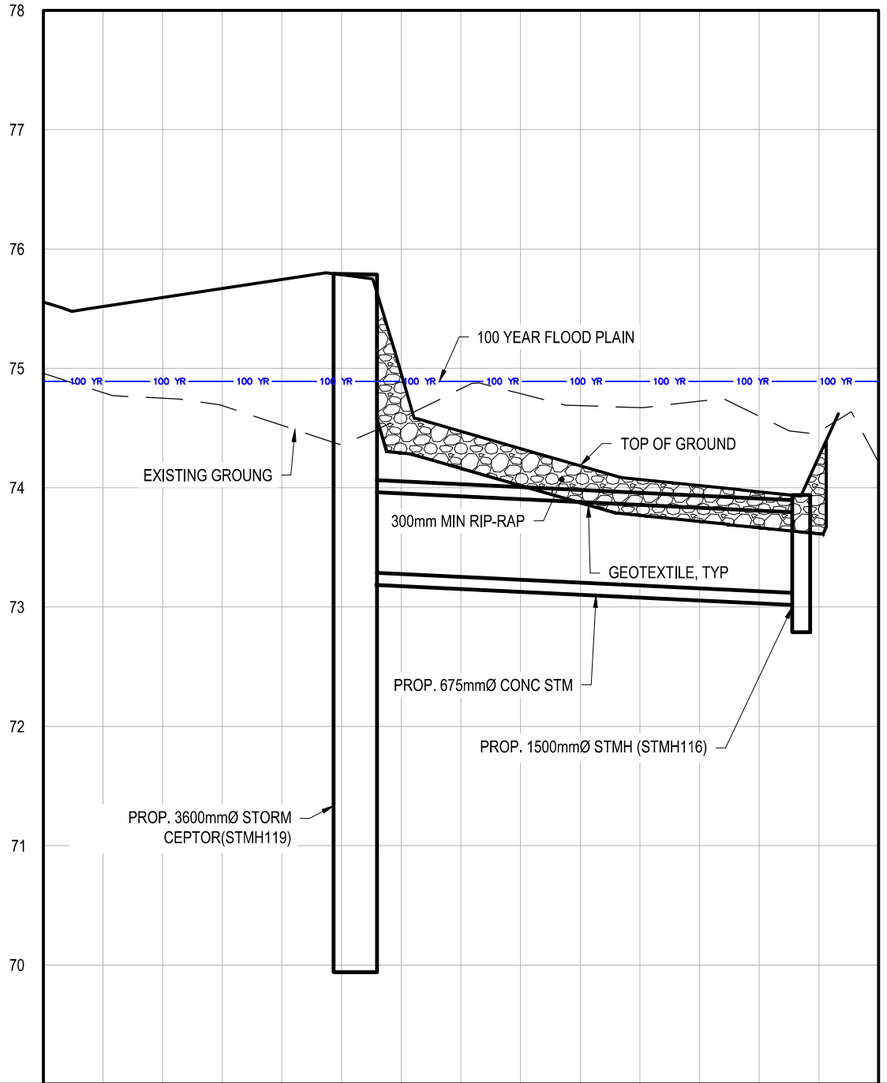

STATION			3+110	3+120	3+130	3+140	3+150	3+160	3+170	STATION		
CENTERLINE GRADE	FINISHED	EXISTING	74.96	74.75	74.52	74.58	74.79	74.67	74.60	74.21	FINISHED	EXISTING	CENTERLINE GRADE
		74.96	74.96	74.75	74.75	74.52	74.52	74.58	74.58	74.79	74.79	74.67	74.67	74.60	74.60	74.21	74.21		

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ORIGINAL SCALE: 1:500	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: D.Y.	
DRAWN BY: J.T.	
CHECKED BY: D.Y./I.J.	25mm

DISCIPLINE:

CIVIL

TITLE:

CROSS SECTION D-D

SHEET NUMBER:

SK6

SHEET #: 1 OF 6

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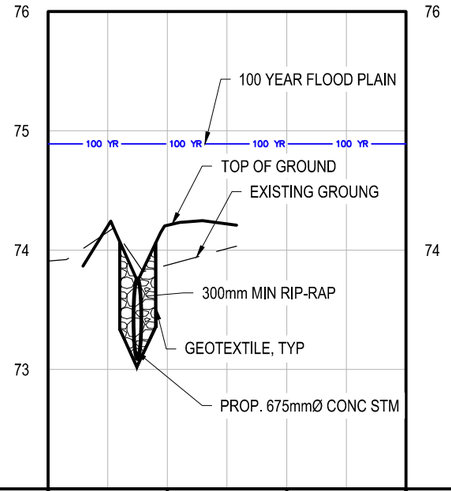

STATION		4+110	4+120	4+130	STATION
CENTERLINE GRADE FINISHED	EXISTING	74.21	74.21		FINISHED EXISTING CENTERLINE GRADE

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DATE: JUNE 2021

ORIGINAL SCALE: 1:500

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DESIGNED BY: D.Y.

DRAWN BY: J.T.

CHECKED BY: D.Y./I.J.

25mm

DISCIPLINE: CIVIL

TITLE: CROSS SECTION E-E

SHEET NUMBER: SK7

SHEET #: 1 OF 7

ISSUE: ISSUED FOR SPA

DATE OF: 2021/06/23

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