NOVATECH

Engineers, Planners & Landscape Architects

Engineering

- Land / Site Development
- Municipal Infrastructure
- Environmental / Water Resources
- Traffic / Transportation
- Structural
- Recreational

Planning

- Land / Site Development
- Planning Application Management
- Municipal Planning Documents & Studies
- Expert Witness (OMB)
- Wireless Industry

Landscape Architecture

- Urban Design & Streetscapes
- Open Space, Parks & Recreation Planning
- Community & Residential Developments
- Commercial & Institutional Sites
- Environmental Restoration

Ahlul-Bayt Centre Ottawa 3095 Albion Road North

Development Servicing Study and Stormwater Management Report

32 Years

Engineering excellence. Planning precision. Inspired landscapes.

AHLUL-BAYT CENTRE OTTAWA
3095 ALBION ROAD NORTH

DEVELOPMENT SERVICING STUDY
AND STORMWATER MANAGEMENT REPORT

Prepared by:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

January 27, 2016
Revised: January 6, 2017

Ref: R-2015-048
Novatech File No. 113093

January 6, 2017

Ahlul-Bayt Centre Ottawa
200 Baribeau Street
Ottawa, Ontario
K1L 7R6

Attention: Mr. Akram Farhat

Dear Sir:

Re: Development Servicing Study and Stormwater Management Report
Ahlul-Bayt Centre Ottawa
3095 Albion Road North
Ottawa, ON
Our File No.: 113093

Enclosed herein is a copy of the revised 'Development Servicing Study and Stormwater Management Report' for the proposed development. The site is located at 3095 Albion Road North, in the City of Ottawa. This report addresses the approach to site servicing and stormwater management for the subject property and is submitted in support of the site plan amendment application.

Please contact the undersigned, should you have any questions or require additional information.

Yours truly,

NOVATECH

François Thauvette, P. Eng.
Project Manager

FT/sm

cc: Syd Robertson (City of Ottawa)
Shawn Lawrence (SJL Architect)
Massoud Yazdani (M&E Engineering)

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

TABLE OF CONTENTS

1.0 INTRODUCTION....1
1.1 Purpose.... 1
1.2 Location and Site Description.... 1
1.3 Consultation and Reference Material.... 2
Reference Items.... 2
2.0 PROPOSED DEVELOPMENT....2
3.0 SITE SERVICING....2
3.1 Sanitary.... 3
3.2 Water.... 4
3.2.1 Domestic Water Demand.... 5
3.2.2 Water Supply for Fire-Fighting.... 6
3.3 Storm and Stormwater Management.... 6
3.3.1 Stormwater Management Criteria and Objectives.... 7
3.4 SWM Modeling (Visual OTTHYMO).... 7
3.4.1 Design Storms.... 8
3.4.2 Model Parameters.... 8
3.4.3 Model Results.... 9
3.4.4 Post-Development Conditions.... 9
3.4.4.1 Major System Overflow Route....10
3.4.4.2 Base Flow....10
3.4.4.3 Stormwater Quality Control....10
4.0 SITE GRADING....11
5.0 EROSION AND SEDIMENT CONTROL....11
6.0 GEOTECHNICAL INVESTIGATIONS....12
7.0 CONCLUSIONS....12

LIST OF FIGURES

Figure 1: Aerial Plan

SWM-1: Pre-Development Stormwater Management

SWM-2: Post-Development Stormwater Management

LIST OF APPENDICIES

Appendix A: Correspondence and Existing MOE CofAs

Appendix B: Development Servicing Study Checklist

Appendix C: FUS Fire Flow Calculations, WM Boundary Conditions, Schematic of the Hydraulic Model, Hydraulic Modeling Results

Appendix D: SWM Modeling Results (Visual OTTHYMO), IDF Curves, Stage-Storage Tables and Broad Crested Weir Calculations

Appendix E: IPEX Inlet Control Device Information

Appendix F: CDS Oil-Grit Separator Information

Appendix G: Engineering Drawings

LIST OF DRAWINGS

General Plan of Services (113093-GP1 and 113093-GP2)

Grading and Erosion & Sediment Control Plans (113093-GR1 and 113093-GR2)

1.0 INTRODUCTION

Novatech has been retained to complete the site servicing and stormwater management design for the proposed Ahlul-Bayt Centre in Ottawa. The proposed development will consist of a two-storey building and associated parking lots. The building will serve as a mosque (place of worship), community centre, recreational facility and school.

1.1 Purpose

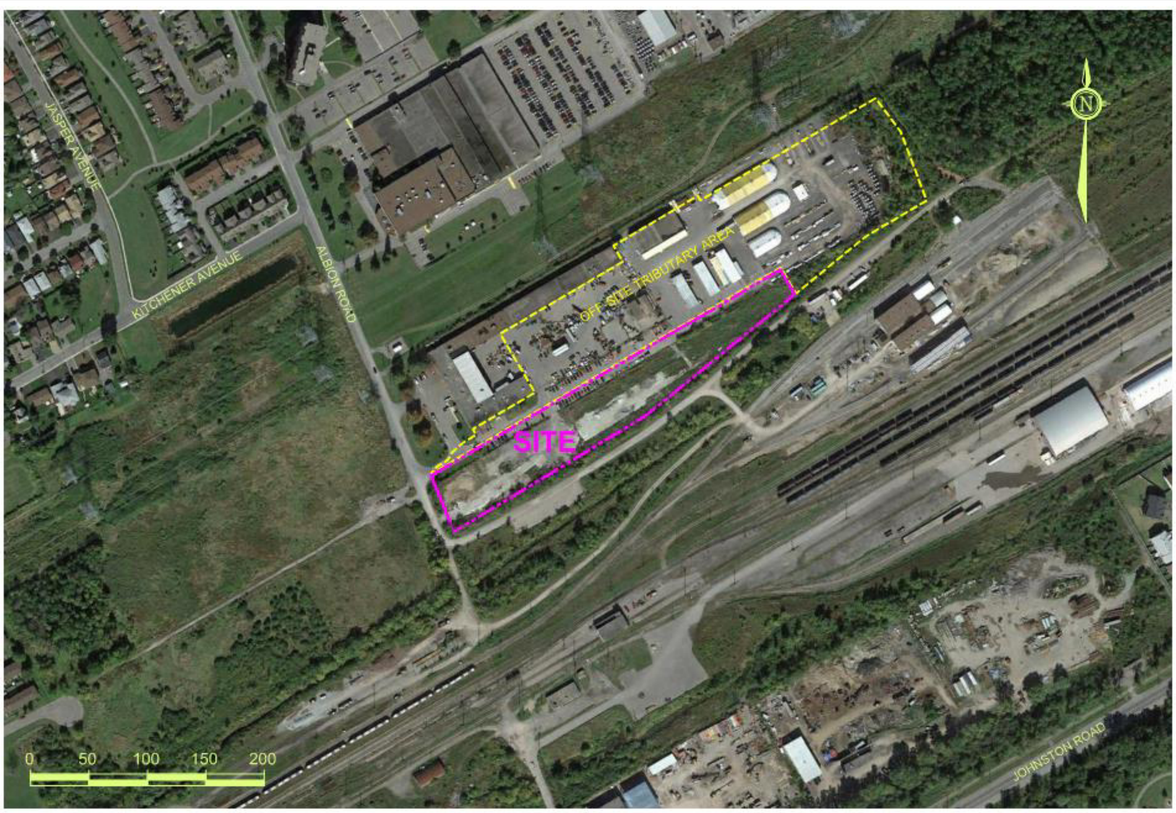
This report addresses the approach to site servicing and stormwater management and is being submitted in support of the site plan amendment application.

1.2 Location and Site Description

The 1.55 ha property is located at 3095 Albion Road North. The existing site is vacant and is bordered by Albion Road to the west; City of Ottawa owned vacant land to the east, the Twin Equipment property to the north and CN Railway lands to the south. Some development work associated with the previously approved design, including the installation of site services, was started in 2010 but never completed.

The subject site is located within the Sawmill Creek sub-watershed and is therefore subject to specific stormwater requirements.

Figure 1 – **Aerial Plan** provides an aerial view of the site.



The legal description of the property is designated as Part of Lot 2, Concession 4 (Rideau Front) Geographic Township of Gloucester, in the City of Ottawa.

1.3 Consultation and Reference Material

An industrial development proposal for this property was completed in 2009/2010. The servicing and stormwater management designs were approved by the City of Ottawa, the Rideau Valley Conservation Authority (RVCA) and Ministry of Environment (MOE) at that time. The following MOE Certificates of Approval (C of A) were obtained for the previously approved works. Refer to **Appendix A** for a copy of the following MOE C of A's:

- Municipal and Private Sewage Works (MOE C of A No. 4934-87QPDD, Aug. 6, 2010)
- Industrial Sewage Works - SWM (MOE C of A No. 2184-87CJLR, July 21, 2010)

Although the 2009/2010 design was approved, the development was never fully constructed. The property was since then sold and the current development is being proposed. A pre-consultation meeting was held with the City of Ottawa on March 27, 2015, at which time the new owner was advised of the general submission requirements for the proposed development. Refer to **Appendix A** for a summary of the correspondence with the City of Ottawa.

The MOECC has been advised of the proposed redevelopment, however a subsequent meeting has not yet been held with the RVCA regarding the new proposal. Based on the previously approved design, we anticipate requiring new approvals from both the MOECC and the RVCA. Refer to **Appendix A** for a copy of the correspondence with the MOECC.

Reference Items

[1] The "Geotechnical Investigation Report" (Ref. No. PG 3635-1) was prepared by Paterson Group Inc. on November 19, 2015.

[2] The "Phase 1 Environmental Site Assessment Report" (Ref. No. PE3666-1R) was prepared by Paterson Group Inc., on June 3, 2016.

[3] The "3091 Albion Road, Twin Realty Ltd. – Fish Habitat Observations" dated August 29, 2009, prepared by Muncaster Environmental Planning.

2.0 PROPOSED DEVELOPMENT

The proposed development will consist of a two-storey building and associated parking lots. The multi-use building will serve as a mosque (place of worship), community centre, recreational facility and school. An enclosed outdoor play area is being proposed on the west side of the building. Similar to the previously approved design, the re-alignment of the existing on-site drainage ditch as well as the construction of a stormwater detention area on the adjacent Twin Equipment property to the north (3091 Albion Road North) will be required to accommodate the proposed development. Access off the municipal roadway will be shared by both properties (3091 & 3095 Albion Road North).

3.0 SITE SERVICING

The proposed building will be serviced by extending services to the municipal watermain and sanitary sewer in Albion Road North. Stormwater flows will continue to be directed into the existing drainage ditch located south of the property. Stormwater runoff from the subject site will be directed to Sawmill Creek. The objective of the site servicing design is to conform to the requirements of the City of Ottawa; to provide a suitable domestic water supply, proper sewage outlets and to ensure that appropriate fire protection is provided. Servicing criteria, expected sewage flows and water demands for the subject site have been established using the City of Ottawa municipal design guidelines for sewer and water distribution. Refer to the enclosed plans and to the subsequent sections of the report for further details.

The City of Ottawa Servicing Study Guidelines for Development Applications requires a Development Servicing Study Checklist to confirm that each applicable item is deemed complete and ready for review by City of Ottawa Infrastructure Approvals. A completed checklist is enclosed in **Appendix B** of the report.

3.1 Sanitary

The proposed building will be serviced by extending a new sanitary sewer from the municipal sanitary sewer in Albion Road North. The existing municipal sewer is a 300mm dia. sewer at a 1.4% slope and has an approximate capacity of 119.4 L/s.

The adjacent Twin Equipment site (3091 Albion Road North) is currently serviced by a 250mm dia. sanitary sewer flowing south across the subject property. The existing 250mm dia. sanitary sewer currently flows into the existing 450mm dia. trunk sewer located in an easement along the south property line of the subject site. This existing Twin Equipment sanitary sewer and trunk sewer are to remain operational. Similar to the proposed site flows, sewage from the trunk sewer is being conveyed to the existing 450mm dia. sanitary sewer in Albion Road North. Refer to the enclosed **General Plan of Services** (**113093-GP1** and **113093-GP2**) for details.

The City of Ottawa design criteria were used to calculate the theoretical sanitary flows for the proposed building. The following design criteria were taken from Section 4 – 'Sanitary Sewer Systems' and Appendix 4-A - 'Daily Sewage Flow For Various Types of Establishments' of the City of Ottawa Sewer Design Guidelines. Due to the nature of the proposed multi-use facility, two uses anticipated to generate the largest peak flows (i.e. a mosque and a school) have been analysed. These scenarios will occur independently.

The first scenario consists of a large religious gathering. This will occur several times per year and the anticipated average daily sewage flows for this scenario will be similar to those used for assembly halls with full facilities. The design criteria for the first scenario are as follows:

- Maximum Design Population: 600 people
- Average Daily Sewage Flow: 36 L/person/day (assembly hall with full facilities)
- Site Area: 1.55 ha
- Institutional Peaking Factor = 1.5
- Infiltration Allowance: 0.28 L/s/ha x 1.55 ha site = 0.43 L/s

Table 3.1 identifies the theoretical sanitary flows based on a large gathering of 600 people.

Table 3.1 Theoretical sanitary flows based on a large religious gathering

Design Flow Basis	Site Area (ha)	Max. Design Population	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infiltration Allowance (L/s)	Total Flow (L/s)
Religious Gathering	1.55	600	0.25	1.5	0.38	0.43	0.81

The second scenario will consist of a typical school use. The design criteria for the second scenario are as follows:

- Maximum Design Population: 170 students & 20 full time staff
- Average Daily Sewage Flow: 90 L/student/day (day school with cafeteria, gym and showers)
- Average Daily Sewage Flow: 75 L/person/day (full-time staff)
- Site Area: 1.55 ha
- Institutional Peaking Factor = 1.5
- Infiltration Allowance: 0.28 L/s/ha x 1.55 ha site = 0.43 L/s

Table 3.2 identifies theoretical sanitary flows based on school use (170 students and 20 staff)

Table 3.2 Theoretical sanitary flows based on a school use

Design Flow Basis	Site Area (ha)	Max. Design Population	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infiltration Allowance (L/s)	Total Flow (L/s)
Students	-	170	0.18	1.5	0.27	-	0.27
Staff	-	20	0.02	1.5	0.03	-	0.03
Total	1.55	190	0.20	1.5	0.30	0.43	0.73*

*Includes an infiltration allowance of 0.43 L/s

Based on the two scenarios analysed above, the large religious gathering yields a slightly larger peak sanitary flow of approximately 0.81 L/s, including infiltration. The proposed 200mm dia. sanitary service will be a gravity pipe at a minimum slope of 1.0% with a full flow conveyance capacity of approximately 34.2 L/s and will have sufficient capacity to convey the theoretical sanitary flows calculated above.

3.2 Water

The proposed building will be serviced by a 150mm dia. water service connected to the existing 150mm dia. watermain in Albion Road North complete with a shut-off valve at the property line. The water meter will be located in the mechanical room; while the remote meter will be located on the exterior face of the building. The proposed building will be sprinklered and supplied with a fire department siamese connection located within 45m of the existing municipal fire hydrant along Albion Road North. The proposed 150mm diameter service will be sized to provide both the required domestic water demand and fire flow for the proposed building. In order to determine if the existing 150mm dia. watermain in Albion Road North has adequate capacity to accommodate the proposed development a hydraulic analysis based on boundary conditions provided by the City of Ottawa was completed. Due to the nature of the proposed multi-use facility, two uses anticipated to generate the largest water demands (i.e. a mosque and a school) have been analysed. These scenarios will occur independently.

Based on the City of Ottawa guidelines, typical watermain operating pressures are as follows:

- Normal operating pressure are to range between 345 kPa (50 psi) and 552 kPa (80 psi) under Max Day demands
- Minimum system pressures are to be 276 kPa (40 psi) under Peak Hour demands
- Minimum system pressures are to be 140 kPa (20 psi) under Max Day + Fire Flow demands

3.2.1 Domestic Water Demand

The theoretical water demands for the proposed building were calculated based on the City of Ottawa and MOE Design Guidelines for Drinking-Water Systems.

The first scenario consists of a large religious gathering. This will occur several times per year and the anticipated water demands will be similar to those used for assembly halls with full facilities. The design criteria for the first scenario are as follows:

- Max Design Population: 600 people
- Max. Day Demand Peaking Factor = 2.75 (Max. value taken from MOE Table 3.1)
- Peak Hour Demand Peaking Factor = 4.13 (Max. value taken from MOE Table 3.1)

Table 3.3 identifies the theoretical domestic water demands based on a large gathering of 600 people.

Table 3.3 Theoretical Domestic Water Demand based on a Large Religious Gathering

Type of Use	Design Population	Average Day Demand (L/s)*	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Religious Gatherings	600	0.25	0.69	1.03

*Value taken from **Table 3.1** above

The second scenario will consist of a typical school use. The design criteria for the second scenario are as follows:

- Max Design Population: 170 students + 20 staff
- Daily Average Water Use: Ranges between 70-140 L/student/day (MOE Table 3.2)
- Maximum Day Demand Peaking Factor = 4.6 (value interpolated from MOE Table 3.3)
- Peak Hour Demand Peaking Factor = 6.9 (value interpolated from MOE Table 3.3)

Table 3.4 identifies the theoretical domestic water demands based on a school use for 170 students and 20 staff.

Table 3.4 Theoretical Water Demand based on a School Use

Type of Use	Design Population	Average Day Demand (L/s)*	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
School	190	0.20	0.92	1.38

*Value taken from **Table 3.2** above, which falls within the typical range defined by the MOE

Based on the two scenarios analysed above, the school use scenario yields slightly larger domestic water demands.

3.2.2 Water Supply for Fire-Fighting

The Fire Underwriters Survey (FUS) was used to estimate fire flow requirements for the proposed building. Based on preliminary FUS calculations, the fire flow requirements for the building are expected to be in the order of 2,114 USGPM (or 8,000 L/min). The fire flow requirements include both sprinkler system and hose allowances in accordance with the OBC and NFPA 13. The sprinkler system will be designed by the fire protection (sprinkler) contractor as this process involves detailed hydraulic calculations based on building layout, pipe runs, head losses, fire pump requirements, etc. Refer to **Appendix C** for a copy of the FUS fire flow calculations.

The hydraulic model EPANET was used for the purpose of analyzing the performance of the proposed water service for the following theoretical conditions:

- Maximum Day + Fire Flow Demand
- Peak Hour Demand

A schematic representation of the hydraulic network depicts the node and pipe numbers used in the model. The model is based on hydraulic boundary conditions provided by the City of Ottawa. **Table 3.5** and **Table 3.6** summarize the hydraulic model results. Refer to **Appendix C** for further details.

Table 3.5: Maximum Day + Fire Flow Demand

Operating Condition	Min. System Pressure	Max. System Pressure
A Max Day demand of 0.92 L/s at Node N4 (Building) + a Fire Flow of 133 L/s at Node N3 (Hydrant)	A minimum system pressure of 255.35 kPa (37.04 psi) is available at Node N3 (Hydrant)	A maximum system pressure of 335.50 kPa (48.66 psi) is available at Node N2 (Connection)

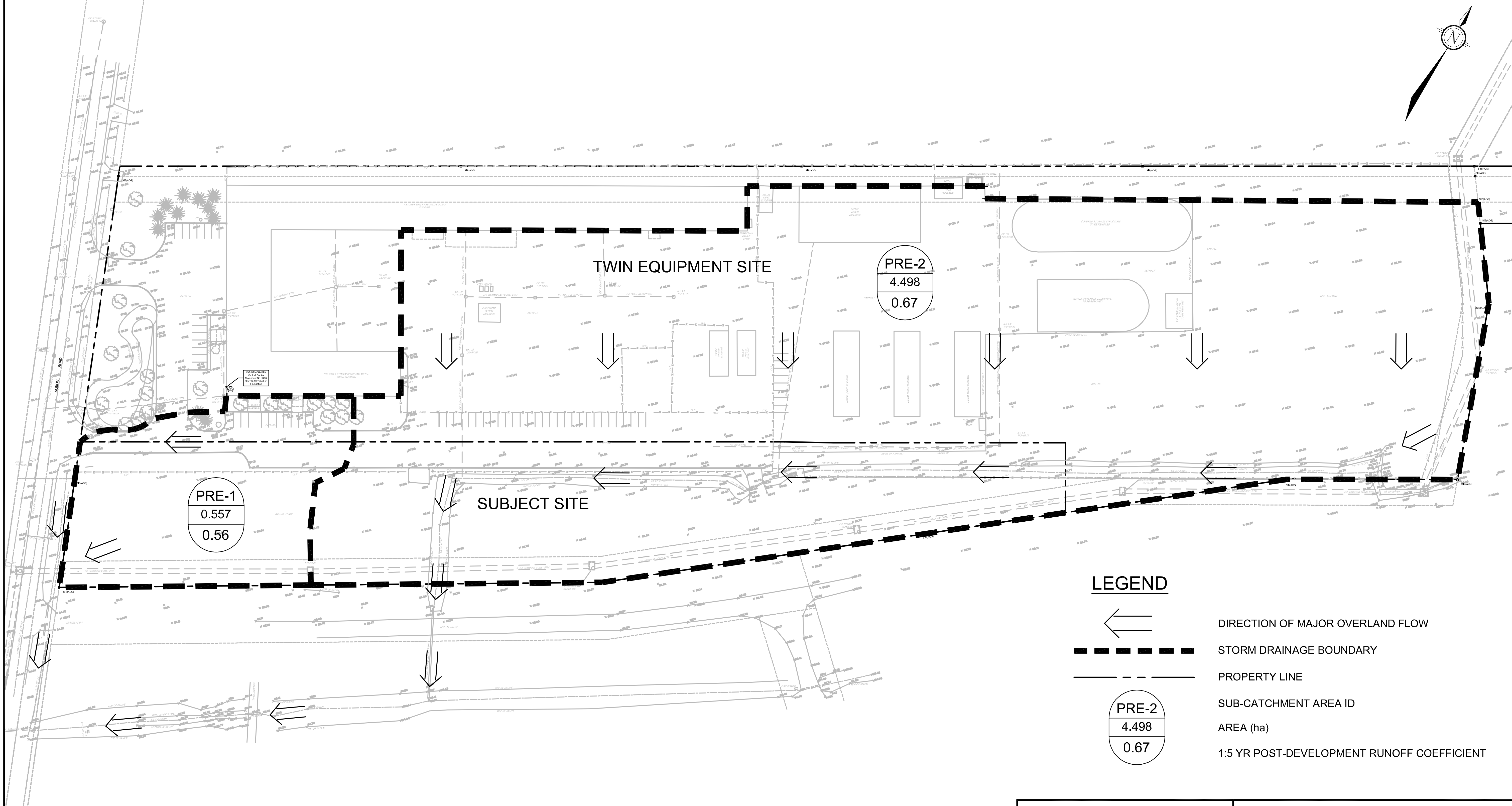
Table 3.6: Peak Hour Demand

Operating Condition	Min. System Pressure	Max. System Pressure
A Peak Hour demand of 1.4 L/s at Node N4 (Building)	Minimum system pressures of 356.00 kPa (51.63 psi) are available at Node N4 (Building)	A maximum system pressure of 369.84 kPa (53.64 psi) is available at Node N3 (Hydrant)

The model results indicate that the proposed water service will provide adequate system pressures for both the Maximum Day + Fire Flow Demand and Peak Hour Demand conditions, within the normal operating pressure ranges specified by the City of Ottawa.

3.3 Storm and Stormwater Management

The total drainage area (5.055 ha) for this project includes both the subject site (1.546 ha) and a portion of the neighbouring Twin Equipment site (3.509 ha), which currently drains through the subject site. Under pre-development conditions, all flows sheet drain uncontrolled off site. As indicated in **Figure SWM-1: Pre-Development Stormwater Management Plan**, runoff either



LEGEND

DIRECTION OF MAJOR OVERLAND FLOW

STORM DRAINAGE BOUNDARY

PROPERTY LINE

PRE-2 — SUB-CATCHMENT AREA ID

4.498 — AREA (ha)

0.67 — 1:5 YR POST-DEVELOPMENT RUNOFF COEFFICIENT

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

AHLUL-BAYT CENTRE OTTAWA (ABCO)

PRE-DEVELOPMENT STORMWATER MANAGEMENT

SCALE		
NOT TO SCALE		
DATE JAN 2016	JOB 113093	FIGURE SWM-1

sheet drains directly towards Albion Road North or towards the on-site drainage ditch, which drains into the larger ditch located south of the subject site. All site flows are tributary to Sawmill Creek.

Under post-development conditions, the 5.055 ha drainage area will be further divided into the following five (5) sub-catchment areas: R-1, A-0, A-1, A-2 and A-3. Based on the existing elevations, runoff from areas A-0 and A-1 will sheet drain uncontrolled off site, while runoff from the remaining areas R-1, A-2 and A-3 (contributing off-site flows from the Twin Equipment site) will be directed towards the re-aligned on-site drainage ditch and be controlled prior to being released into the ditch tributary to Sawmill Creek, located south of the property. Refer to **Figure SWM-2: Post-Development Stormwater Management Plan** for details. The re-aligned on-site ditch will be enhanced with a large upstream surface storage area to the west. Stormwater runoff directed into the re-aligned ditch will be backed up by the control structure, located near the site outlet, and directed towards the upstream surface storage area. The re-aligned drainage ditch and stormwater detention area will provide water quantity control for the site up to and including the 1:100 year design event, pursuant to the requirements of the Sawmill Creek sub-watershed study. Refer to the **General Plan of Services** (**113093-GP1**) for details.

Due to the nature of the site and the receiving waters (Sawmill Creek), all stormwater runoff from the site, with the exception of the direct runoff, will be directed through an oil-grit separator unit prior to being conveyed to the existing drainage ditch south of the subject site. The stormwater interceptor and the storage facility will provide the required water quality control prior to directing flows off-site.

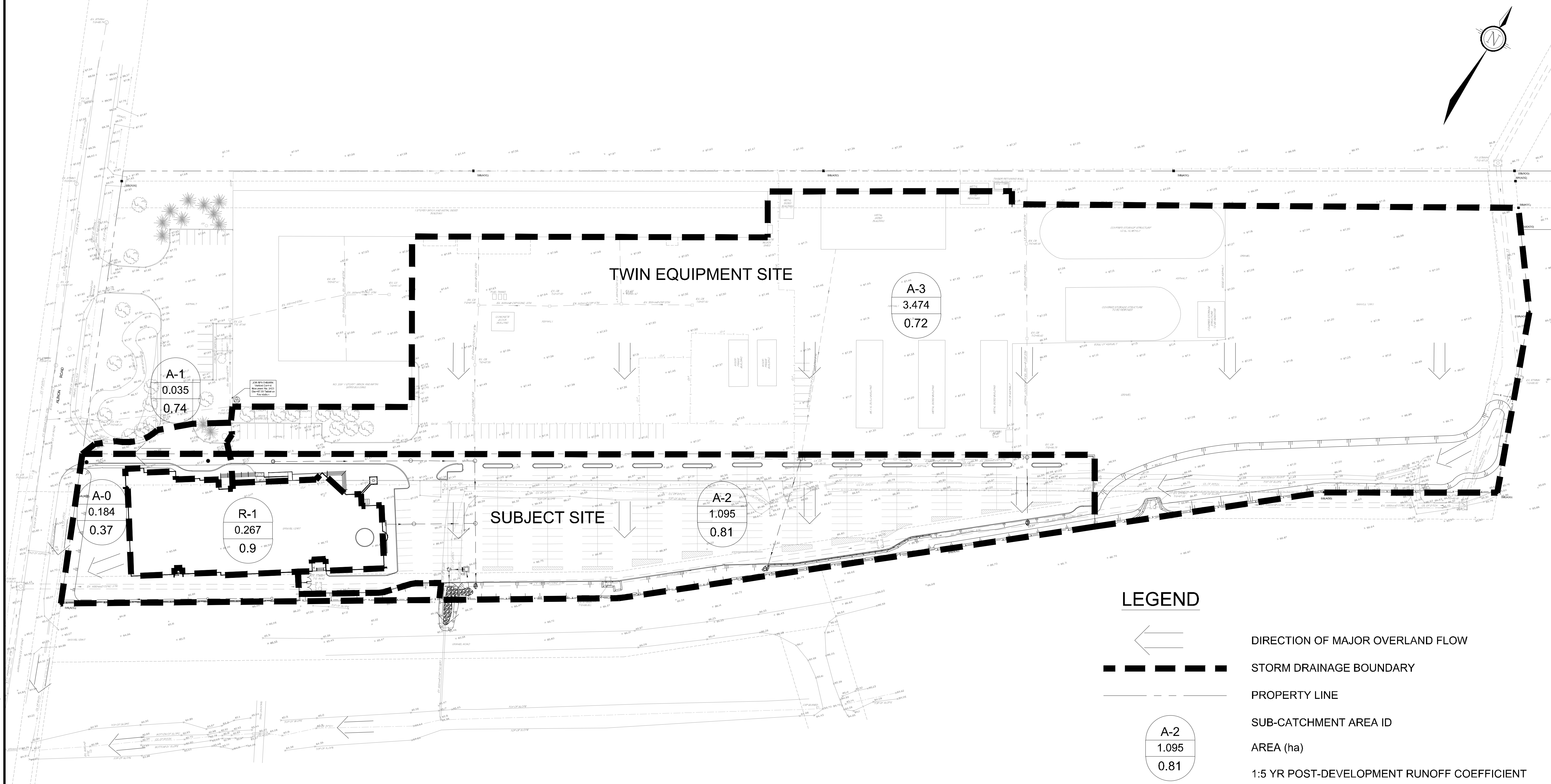
3.3.1 Stormwater Management Criteria and Objectives

The criteria and objectives for the proposed stormwater management design are as follows, per the requirements of the Sawmill Creek Subwatershed Study Update:

- Provide 500m^3/ha of storage at a release rate of 4.8 L/s/ha;
- For flows in excess of the initial storage requirement, control post-development flows to pre-development levels;
- Provide on-site water quality control (minimum 80% TSS removal) prior to releasing flows from the site;
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

3.4 SWM Modeling (Visual OTTHYMO)

The stormwater management design was evaluated using the Visual OTTHYMO hydrologic model, which uses storage-discharge rating curves to represent the range of release rates over the full operating depth of the system.



LEGEND

DIRECTION OF MAJOR OVERLAND FLOW

STORM DRAINAGE BOUNDARY

PROPERTY LINE

A-2 / 1.095 / 0.81 — SUB-CATCHMENT AREA ID / AREA (ha) / 1:5 YR POST-DEVELOPMENT RUNOFF COEFFICIENT

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

AHLUL-BAYT CENTRE OTTAWA (ABCO)

POST-DEVELOPMENT STORMWATER MANAGEMENT

SCALE: NOT TO SCALE

DATE: JAN 2016 | JOB: 113093 | FIGURE: SWM-2

3.4.1 Design Storms

The following design storms were simulated to determine which storm distribution generates the highest peak flows and storage requirements:

Chicago Storms	SCS Type II Storms
4 hour, 2 year	12 hour, 2 year
4 hour, 5 year	12 hour, 5 year
4 hour, 100 year	12 hour, 100 year
24 hour, 2 year	24 hour, 2 year
24 hour, 5 year	24 hour, 5 year
24 hour, 100 year	24 hour, 100 year

The 24 hour Chicago storm yielded the highest peak flows from the site and was therefore used as the critical storm distribution for the design. Simulation results for all storms have been included in **Appendix D**.

3.4.2 Model Parameters

Sub-catchment Areas

Table 3-7 summarizes the sub-catchment areas and parameters used in the model. Refer to **Figure SWM-2: Post-Development Stormwater Management Plan** for details.

Table 3-7: Catchment Parameters

Area ID	Area (ha)	Runoff Coefficient	% Impervious (OTTHYMO)	
			Directly Connected (XIMP)[2]	Total (TIMP)
A-0	0.184	0.37	0.28	0.28
A-1	0.035	0.74	0.78	0.78
R-1 + A-2[1]	(0.267 + 1.095) 1.362	0.84	0.73	0.91
A-3	3.474	0.72	0.68	0.85
Total	**5.055 (Use 5.1)**			

[1] The model includes sub-catchment R1 and A2 as a single catchment.
[2] XIMP values are taken as 80% of TIMP values for areas A2 and A3 due to the presence of large roof areas

The total drainage area used in the calculations (5.1 ha) includes both the subject site (1.6 ha) and contribution flows from the neighbouring Twin Equipment property (3.5 ha) to the north, which drains through the subject site. Release rates and required storage volumes, however, are based on the site area. Based on discussions with the City of Ottawa, off-site flows from the Twin Equipment property will be allowed to drain through the proposed stormwater system at pre-development rates.

All drainage areas were simulated using the Standard Unit Hydrograph (STANDHYD) subroutine. Infiltration was simulated using Horton's Equation with the standard values listed in City of Ottawa Sewer Design Guidelines.

Storage-Discharge Rating Curves

The head vs. discharge rating curves for the proposed ICD were used to create storage-discharge rating curves based on the storage characteristics for each area. These storage-discharge curves were then included in the OTTHYMO model using the ROUTE RESERVOIR subroutine. The stage-storage-discharge curves and supporting calculations are provided in **Appendix D**. Details of the proposed ICD specification are provided in **Appendix E**.

3.4.3 Model Results

The modelling results indicate a storage requirement of 1,145m^3 during the 1:100-year design event. The maximum storage available in the stormwater detention area is approximately 2,180m^3 up to an elevation of 86.45m. The 100-year overall release rate is 1,041 L/s, which is less than the existing conditions 1,872 L/s. The full model output results are provided in **Appendix D**. During the 2-year storm, the total outflow is 162 L/s (compared to 624 L/s under existing conditions) with a storage volume of 960 m^3 used. The sub-watershed storage requirement of 770m^3 released at 7 L/s is attained at a rainfall volume slightly less than what was calculated for the 2-year storm.

Table 3.5 compares the post-development flows from the site to be developed to the pre-development flows for the 1:2 year, 1:5 year and 1:100 year design events.

Table 3.5: Comparison of Pre-Development Flows to Post-Development Flows

Return Period (Years)	Pre-Development Flow (L/s)	Post-Development Flow (L/s)		
	Total Area (5.1 ha)	A-0 + A-1	A-2 + A-3 + R-1	Total Area (5.1 ha)
2	624 L/s	18 L/s	159 L/s *	162 L/s *
5	899 L/s	26 L/s	359 L/s *	371 L/s *
100	1,872 L/s	58 L/s	988 L/s *	1,041 L/s *

*Indicates controlled flow or partially controlled flows

As indicated in the table above, the post-development flows are significantly reduced when compared to the pre-development conditions. The post-development flows have been controlled per the requirements of the Sawmill Creek Subwatershed Study.

3.4.4 Post-Development Conditions

The proposed building will be serviced by a 250mm diameter storm sewer which outlets to the realigned drainage ditch via the proposed storm sewer system. The re-aligned drainage ditch and upstream stormwater detention area will drain through STM MH 5 which contains the IPEX Tempest LMF 95 vortex ICD which has an invert of 85.00m. Flow is then directed to the oil-grit separator unit (CDS model PMSU 20_15_4) which provides quality treatment. Flow is then directed to the existing ditch and the 600mm diameter CSP culvert on the downstream lands. An overflow weir is also provided for flows in excess of the control flows from the sub-watershed study (7 L/s). This weir is proposed to have an invert of 86.00m and to have a width of 3.2m as shown on the **General Plan of Services** (**113093-GP1**).

3.4.4.1 Major System Overflow Route

In the case of a major rainfall event exceeding the design storms provided for, stormwater located within the re-aligned drainage ditch will pond to a maximum water elevation of 86.40m before spilling over the top of the bank and draining south towards the larger drainage ditch, tributary to Sawmill Creek. The major system overflow route is shown on the enclosed **Grading and Erosion & Sediment Control Plans** (**113093-GR1** and **113093-GR2**).

3.4.4.2 Base Flow

Due to the nature of this site and the receiving waters (Sawmill Creek) a general assessment of base flow, including both groundwater and surface flows should be considered.

The soils within the western portion of the site to be developed are underlined with a layer of silty-clay approximately 2m thick, which will act as a barrier for groundwater flow. The soils within the eastern portion of the site however mostly consist of silty-sand, which allows the flow of groundwater. The majority of the eastern portion of the site will remain undeveloped. Furthermore, the construction of the SWM detention area and re-aligned on-site drainage ditch will promote infiltration of stormwater into the ground.

Although the on-site drainage ditch is being re-aligned, the tributary area, drainage patterns and outlet point from the site (i.e. via the existing 600mm dia. culvert) to the larger existing tributary of Sawmill Creek south of the property, are all being maintained. This is consistent with the conclusion of the fish and fish habitat assessment report entitled: “3091 Albion Road, Twin Realty Ltd. – Fish Habitat Observations” dated August 29, 2009, prepared by Muncaster Environmental Planning. The following excerpt was taken directly from the report: “Providing downstream inputs are maintained, removal of the on-site channels would not appear to have the potential to impact the productivity of the Sawmill Creek System”.

Consequently, the proposed development should not adversely affect the base flow from this site and should have no impact on the receiving ditch or Sawmill Creek.

3.4.4.3 Stormwater Quality Control

The subject site is located within the jurisdiction of the Rideau Valley Conservation Authority (RVCA) and is tributary to Sawmill Creek. As a result, an ‘Enhanced’ Level of Protection, equivalent to a long-term average removal of 80% of total suspended solids (TSS), with at least 90% of the total rainfall being captured and treated, is required.

The shallow slope of the re-aligned drainage ditch along with the low flow outlet will promote settling of suspended solids and infiltration through the bottom of the stormwater management system. As an extra level of quality control protection, a new oil-grit separator unit (CDS Model PMSU 20_15_4m) will be installed downstream of STM MH 5 on the proposed 300mm dia. outlet pipe from the site. Stormwater runoff collected by the on-site storm sewer system from areas R-1, A-2 and A-3 (4.84 ha tributary area) will be directed through the proposed treatment unit. The contributing area includes the proposed paved parking areas, the building roof, the on-site landscaped areas as well as a portion of the existing site to the north.

As stated above, the proposed oil-grit separator has been sized to provide an 'Enhanced' level of water quality treatment prior to discharging the stormwater towards the municipal drainage system south of the site. Echelon Environmental and Contech Stormwater Solutions Inc. have modeled and analyzed the tributary area to provide a CDS unit capable of meeting the TSS removal requirements. The model parameters for the TSS removal were based on historical rainfall data for Ottawa from the Ontario Climate Centre. It was determined that a CDS Model PMSU 20_15_4m will exceed the target removal rate, providing a net annual 83.6% TSS removal. The CDS unit has a treatment capacity of approximately 20 L/s, a sediment storage capacity of 1.0m^3; an oil storage capacity of 232 L, a total storage volume of 1.78m^3 and will treat a net annual volume of approximately 99.0% for the tributary area.

Maintenance and Monitoring of Storm Sewer and SWM Systems

It is recommended that the client implement a maintenance and monitoring program for both the on-site storm sewers and the stormwater management systems: The storm drainage system should be inspected routinely (at least annually); the vortex ICD unit should be inspected to ensure it is fitted securely and free of debris; and the oil-grit separator should be inspected at regular intervals and maintained when necessary to ensure optimum performance.

Refer to **Appendix F** for the CDS unit operation, design, performance and maintenance summary parameters as well as the annual TSS removal efficiency data.

4.0 SITE GRADING

The existing site slopes towards the existing on-site drainage ditch. A portion of the existing Twin Equipment site to the north also sheet drains onto the subject site. To accommodate the proposed development, the existing ditch will be filled-in and re-aligned next to the south property line. The finished floor elevation (FFE) of the proposed building will be set at an elevation of 88.40m. The proposed site will match into the Twin Equipment access road pavement elevations and slope south towards the re-aligned drainage ditch. The storm sewer system will be shallow due to the fact that it outlets into an open ditch. The grades adjacent to the perimeter of the subject site will be maintained, where possible. Refer to the enclosed **Grading and Erosion & Sediment Control Plans** (**113093-GR1** and **113093-GR2**) for details.

5.0 EROSION AND SEDIMENT CONTROL

To mitigate erosion and to prevent sediment from entering the storm sewer system, temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter bags will be placed under the grates of nearby catchbasins, manholes and will remain in place until vegetation has been established and construction is completed.
- Silt fencing will be placed as per OPSS 577 and OPSD 219.110 along the surrounding construction limits;
- Straw Bale Flow Check Dams will be placed per OPSD 219.180 as indicated on the plans;
- A Mud Mat will be placed at the site entrance;
- Street sweeping and cleaning will be performed as required to suppress dust and to provide safe and clean roadways adjacent to the construction site.

The temporary erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of the erosion control measures will be undertaken regularly.

In addition, the following will provide permanent erosion and sediment control measures:

- Grass drainage swales along the property lines and the stormwater detention area as indicated on the plans;
- Rip-rap lined outlet to reduce flow velocities and minimize erosion to the existing ditch.
- A CDS type Oil/Grit Separator will be installed to provide water quality control prior to releasing stormwater from sub-catchment areas R-1, A-2 and A-3.

6.0 GEOTECHNICAL INVESTIGATIONS

A Geotechnical Investigation Report has been prepared for the proposed site. Refer to the Paterson Group 'Geotechnical Investigation' (Report. No. PG3635-1), dated November 19, 2015 for subsurface conditions, construction recommendations and geotechnical inspection requirements.

7.0 CONCLUSIONS

This report has been prepared in support of the site plan amendment application for the proposed Ahlul-Bayt Centre Ottawa located at 3095 Albion Road North, in the City of Ottawa.

The conclusions are as follows:

- The proposed development will consist of a 2-storey multi-use building complete with associated parking lot and landscaped areas.
- The proposed building will be serviced by extending services to the municipal watermain and sanitary sewer in Albion Road North.
- The building will be sprinklered and supplied with a fire department siamese connection. The siamese connection will be located within 45m of the existing municipal fire hydrant along Albion Road North.
- On-site water quantity control and water quality control are required for this site.
- Water quantity control will be achieved by the use of an inlet control device, a concrete control weir structure and surface detention within the re-aligned drainage ditch and stormwater detention areas.
- Stormwater management for the site will be provided by a surface stormwater storage system, which has been adequately sized to provide the required storage in order to control the 100-year post-development flow and over control the 5-year flow from the site to the allowable release rates.
- Additional on-site water quality treatment will be provided by the installation of an oil-grit separator (CDS Model PMSU 20_15_4m) downstream of the proposed inlet control device installed STM MH 5. The treatment unit will provide 83.6% TSS removal and will treat 99.0% of the total annual runoff.

- Regular inspection and maintenance of the storm sewer system, including the inlet control device (ICD), concrete control weir, stormwater storage facility and CDS unit, is recommended to ensure that the storm drainage system is clean and operational.
- The tributary area, drainage patterns and outlet point from the site to the existing tributary of Sawmill Creek south of the property, are all being maintained.
- The proposed development should not adversely affect the base flow from this site and should have no impact on the receiving ditch or Sawmill Creek.
- Erosion and sediment controls are to be provided both during construction and on a permanent basis.

It is recommended that the proposed site servicing and stormwater management design be approved for implementation.

NOVATECH

Servicing/Grading Prepared by:

Stephen Matthews, B. A.(Env)
Senior Design Technologist

SWM Prepared by:

Bryan Orendorff, P. Eng.
Project Manager | Water Resources

Servicing/Grading Reviewed by:

François Thauvette, P. Eng.
Senior Project Manager | Land Development & Public Sector Engineering

APPENDIX A

Correspondence and Existing MOE CofAs

Steve Matthews

From: Robertson, Syd <Syd.Robertson@ottawa.ca>
Sent: March-27-15 7:56 AM
To: Francois Thauvette
Cc: Jort-Conway, Melissa
Subject: Albion Rd N_3095 - Pre-consultation Servicing Memo
Attachments: Albion Rd N_3095 - Servicing Memo.pdf

Hi Francois:

Attached please find a copy of the Pre-consultation Servicing Memo for the above noted site.

Please call me if you have any questions.

Thanks,

Syd Robertson, C.E.T.
Project Manager, Infrastructure Approvals
Development Review Services Branch, Urban Outer Core
Planning & Growth Management Department
110 Laurier Ave. W., 4th Floor E
Ottawa, ON K1P 1J1

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27916
ottawa.ca/planning / ottawa.ca/urbanisme

27 Mar 2015

To / Destinataire	Melissa Jort-Conway, Planner
From / Expéditeur	Syd Roberson, Infrastructure Project Manager
Subject / Objet	**Pre-Application Consultation** **3095 Albion Rd. N, Ward 10** *The proposed development includes a community centre, recreational and athletic facility, mosque (place of worship) and school.* File No. **PC2013-0194**

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 & site works shall be in accordance with the following documents:
   - ⇨ Ottawa Sewer Design Guidelines (2013)
   - ⇨ 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 (2004)
   - ⇨ City of Ottawa Environmental Noise Control Guidelines (2006)
   - ⇨ City of Ottawa Park and Pathway Development Manual (2012)
   - ⇨ City of Ottawa Accessibility Design Standards (2012)
   - ⇨ Ottawa Standard Tender Documents (2015)
   - ⇨ Ontario Provincial Standards for Roads & Public Works (2014)

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. Stormwater Management Criteria

   The municipal storm system on Albion Road north, outlets to a drainage ditch that is a direct tributary to Sawmill Creek, downstream of the Sawmill Creek Wetlands Stormwater Management Facility. Consequently on-site stormwater quantity and water quality controls will be required based on the criteria in the Sawmill Creek Sub-Water Study.

   i. Water Quality Treatment:

      Enhance level of treatment (80% TSS removal).

ii. Quantity Control:

To be based on the following Table from the Sawmill Creek Subwatershed Study Update, dated May 2003, prepared by CH2MHill.

Table 16 Estimated stormwater detention storage-outflow relationship

Estimated Stormwater Detention Storage-Outflow Relationship
needed for downstream creek erosion control in Sawmill Creek

Effective imperviousness of development area	Estimated detention storage required	Peak storage release rate
% of total area	m^3 per hectare of development area	L/s per ha of development area
70%	500	4.8
60%	330	4.1
50%	280	3.5
42%	260	3.0
35%	230	2.7

Notes:

1. The effective impervious represents the amount of impervious area that drains directly to the site's drainage outlet (e.g. storm sewer). Runoff from the ineffective impervious area is assumed to be infiltrated. As an example, a site with 60% total actual imperviousness and in which 30% of impervious runoff is infiltrated, would have an effective imperviousness of 42%.

The above detention requirements represent a general design guideline that is derived from the analysis detailed in Appendix C. As indicated, the detention volume requirement is substantially reduced if effective imperviousness is reduced by runoff reduction by infiltration within development areas. This shows that designing to promote infiltration has the double benefit of reducing downstream erosion impact while helping to maintain local infiltration.

5. Deep Services (Storm, Sanitary & Water Supply)
   - i. New connections to the 600mm dia backbone watermain as well as to the easement sanitary & storm sewers are not permitted.
   - ii. Provide a sanitary monitoring manhole located in an accessible location on private property near the property line (ie. Not in a parking area).

6. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:
   - i. Location of service
   - ii. Type of development
   - iii. Amount of fire flow required – Calculations to be based on the Fire Underwriters Survey.
   - iv. Average daily demand: ___ l/s.
   - v. Maximum daily demand: ___l/s.
   - vi. Maximum hourly daily demand: ___ l/s.

Francois Thauvette

From: Francois Thauvette
Sent: Friday, January 06, 2017 12:08 PM
To: 'Diamond, Emily (MOECC)'
Subject: Proposed Ahlul-Bayt Centre Ottawa (3095 Albion Rd. North) - Pre-consultation w MOECC
Attachments: MOE CofA_4934-87QPDD.pdf; MOE CofA_2184-87CJLR.pdf

Hi Emily,

We are working a new project located at 3095 Albion Road North, in the City of Ottawa. The proposed development will consist of a two-storey building and associated parking lots. The multi-use building will serve as a mosque (place of worship), community centre, recreational facility and school. An enclosed outdoor play area is being proposed on the west side of the building. Similar to the previously approved design, the re-alignment of the existing on-site drainage ditch as well as the construction of a stormwater detention area on the adjacent Twin Equipment property to the north (3091 Albion Road North) will be required to accommodate the proposed development. Access off the municipal roadway will be shared by both properties (3091 & 3095 Albion Road North).

This e-mail is to advise you that an industrial development proposal for this same property was completed in 2009/2010. The servicing and stormwater management designs were approved by the City of Ottawa, the Rideau Valley Conservation Authority (RVCA) and Ministry of Environment (MOE) at that time. The following MOE Certificates of Approval (C of A) were obtained for the previously approved works (PDF copies attached):

- Municipal and Private Sewage Works (MOE C of A No. 4934-87QPDD, Aug. 6, 2010)
- Industrial Sewage Works - SWM (MOE C of A No. 2184-87CJLR, July 21, 2010)

Although the 2009/2010 design was approved and Site Plan approval was obtained, the development was never fully constructed. The property was since sold and the development described in the first paragraph above is being proposed. A pre-consultation meeting was held with the City of Ottawa, at which time the new owner was advised of the general submission requirements for the proposed development.

Based on the proposed design, we anticipate requiring new ECAs (or amendments to the existing C of As). Please use this a record of our pre-consultation with the MOECC.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

RECEIVED AUG 1 2 2010

Ontario

Ministry of the Environment
Ministère de l'Environnement

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 4934-87QPDD
Issue Date: August 6, 2010

Twin Realty Ltd.
3091 Albion Road N
Ottawa, Ontario
K1V 9V9

Site Location: 3091 & 3095 Albion Road, N. Ward 10
City of Ottawa

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

storm sewers and ***sanitary sewers*** to be constructed in the City of Ottawa, on 3095 Albion Road N;

all in accordance with the application from Twin Realty Ltd., dated **June 16, 2010,** including final plans and specifications prepared by Novatech Engineering Consultants Ltd.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act , R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to eachportion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Director

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 6th day of August, 2010

Jennifer Barolet, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

DR/

c: District Manager, MOE Ottawa
Sarah McCormick, Novatech Engineering Consultants Ltd.
Richard Buchanan, Program Manager, Infrastructure Approvals
Linda Carkner, Program Manager, Infrastructure Services
Francois Thauvette, Novatech Engineering Consultants

RECEIVED JUL 2 6 2010

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDED CERTIFICATE OF APPROVAL
INDUSTRIAL SEWAGE WORKS
NUMBER 2184-87CJLR
Issue Date: July 21, 2010

Twin Realty Ltd.
3091 Albion Rd N
Ottawa, Ontario
K1V 9V9

Site Location: Twin Equipment
3091and 3095 Albion Road North
Ottawa City,

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

the establishment of stormwater management *Works* to serve the Twin Equipment / Albion North Business Park commercial development located at 3091 Albion Road North and 3095 Albion Road North bordered by Albion Road to the west, City of Ottawa owned vacant land to the east, a Hydro corridor to the north and CN Railway lands to the south in the City of Ottawa, for the treatment and disposal of stormwater run-off from a catchment area of 6.52 hectares consisting of four catchment areas A1, A2, A3 and A4, to provide Enhanced water qualify protection and to attenuate post-development peak flows to pre-development levels, discharging to the Sawmill Creek tributary, for all storm events up to and including the 100 year return storm, comprising of an on-site drainage ditch, inlet control devices (ICD) and an oil/grit separator as follows:

Proposed SWM Facility for Catchment Area A3 (0.67 ha.) and A4 (4.36 ha.)

- a stormwater management system to provide Enhanced water quality control and quantity control flow of 473.2 L/s during the 5-year storm event and 581.2 L/s during the 100 year storm even, comprised of the following:

- a realigned ditch at the western portion of the site, having an active storage volume of approximately 128.3 m^3 during the 100 year storm event and a total storage volume of 216 m^3, discharging to a manhole STM MH 1 described below;
- a manhole STM MH 1, receiving runoff from the realigned ditch and from the on-site storm sewer system, equipped with a 205 mm diameter orifice plate ICD to control discharge from STM MH 1 at a maximum 5-year storm flowrate of 64.1 L/s and a maximum 100-year storm flowrate of 78.5 L/s, discharging via a 450 mm diameter pipe, manhole STM MH 4 and a 600 mm diameter pipe to an oil/grit separator described below;
- a realigned ditch at the eastern portion of the site, having an active storage volume of approximately 1,030.1

m^3 during the 100 year storm event and a total storage volume of 1,264 m^3, discharging to a manhole STM MH 2 described below;

- a manhole STM MH 2, receiving runoff from the realigned ditch and from the on-site storm sewer system, equipped with a 433 mm diameter orifice plate ICD to control discharge from STM MH 2 at a maximum 5-year storm flowrate of 310.6 L/s and a maximum 100-year storm flowrate of 370.6 L/s, discharging via a 525 mm diameter pipe, manhole STM MH 4 and a 600 mm diameter pipe to an oil/grit separator described below;
- an oil grit separator (model Stormceptor STC 6000), receiving runoff from a catchment area of 5.03 hectares, having a sediment storage capacity of 26.945 m^3, an oil storage capacity of 3.93 m^3 and a total storage capacity of 31.285 m^3, discharging via a 600 mm diameter outlet pipe, headwall, rip-rap to an existing 600 mm diameter culvert that discharges to the Sawmill Creek tributary;

Existing SWM Facility for Catchment Area A1 (0.89 ha.) and A2 (0.6 ha.)

- a stormwater management *Works* for the collection and transmission of stormwater runoff from a catchment area of 1.49 hectares consisting of 0.89 hectares of existing building roof, paved parking and landscaped areas and 0.6 hectares of natural areas with uncontrolled runoff of 30.5 L/s during the 5-year storm event and 64.1 L/s during the 100 year storm event, to attenuate post-development peak flows to pre-development levels for all storm events up to and including the 100 year return storm, consisting of the following:

Stormwater Management System

- a stormwater management system to service a commercial development located at 3091 Albion Road in the City of Ottawa, controlling up to 100-year storm event runoff from a total area of 0.89 hectares relying on a swale and two (2) catchbasins with catchbasin CB1 equipped with an inlet control device (ICD) to control the discharge from CB1 to storm sewer at a maximum 5-year and 100 year storm flowrate of approximately 68.0 L/s;

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned *Works* ;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Industrial Sewage Works submitted by Francois Vachon of Twin Realty Ltd. received on January 23, 2007, related to the Works of the Existing SWM Facility;

2. A report titled "Twin Equipment Servicing Brief and Stormwater Management Report Albion Road, Ottawa" prepared by McIntosh Perry Consulting Engineers dated December 19, 2006, related to the Works of the Existing SWM Facility;.

3. Application for Approval of Municipal and Private Sewage Works submitted by Twin Realty Ltd. dated June 16, 2010;.

4. Stormwater Management Report titled "Twin Equipment / Albion North Business Park 3091 & 3095 Albion Road North" and enclosed design drawings dated July 23, 2009 and revised

December 17, 2009 and January 29, 2010, prepared by Novatech Engineering Consultants Ltd.; and

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

"*Certificate* " means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

"*Director* " means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

"*District Manager* " means the District Manager of the Ottawa District Office of the *Ministry* ;

"*Ministry* " means the Ontario Ministry of the Environment;

"*Owner* " means Twin Realty Ltd. and includes its successors and assignees;

"*Works* " means the sewage works described in the *Owner* 's application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate* .

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The *Owner* shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, setting and operations of the works do not constitute a safety or health hazard to the general public.

(2) Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate* , the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate* .

(3) Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate* , the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(4) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within **five (5) years** of the date of this *Certificate* .

3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director* , in writing, of any of the following changes within **thirty (30) days** of the change occurring:

(a) change of *Owner* ;

(b) change of address of the *Owner* ;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager* ; and

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager* .

4. OPERATION AND MAINTENANCE.

(1) The *Owner* shall ensure that, at all times, the *Works* and related equipment and appurtenances which are installed or used to achieve compliance with this *Certificate* are properly operated and maintained and meet with the operation and maintenance requirements of the Municipality.

(2) The *Owner* shall inspect the *Works* at least **once a year** and, if necessary, clean and maintain the *Works* to prevent the excessive buildup of sediments, oil/grit and/or vegetation.

(3) The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at a readily accessible location for inspection by the *Ministry* . The logbook shall include the following:

(a) the name of the *Works* ; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. RECORD KEEPING

The *Owner* shall retain for a minimum of **five (5) years** from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this *Certificate* .

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment..

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to approved works and to ensure that subsequent owners of the works are made aware of the certificate and continue to operate the works in compliance with it.

4. Condition 4 is included to require that the *Works* be properly operated and maintained such that the environment is protected .

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works* .

This Certificate of Approval revokes and replaces Certificate(s) of Approval No. 2670-765K2X issued on August 17, 2007

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act , R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 21st day of July, 2010

THIS CERTIFICATE WAS MAILED
ON July 22, 2010
AK
(Signed)

Jennifer Barolet, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

AM/

c: District Manager, MOE Ottawa
Francois Thauvette, Novatech Engineering Consultants Ltd.

APPENDIX B

Development Servicing Study Checklist

ABCO 113093

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- N/A ☐ Executive Summary (for larger reports only).
- ☑ Date and revision number of the report.
- ☑ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☑ Plan showing the site and location of all existing services.
- ☑ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.
- ☑ Summary of Pre-consultation Meetings with City and other approval agencies.
- ☑ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.
- ☑ Statement of objectives and servicing criteria.
- ☑ Identification of existing and proposed infrastructure available in the immediate area.
- ☑ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).

☑ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.

N/A ☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.

N/A ☐ Proposed phasing of the development, if applicable.

☑ Reference to geotechnical studies and recommendations concerning servicing.

☑ All preliminary and formal site plan submissions should have the following information:

- Metric scale
- North arrow (including construction North)
- Key plan
- Name and contact information of applicant and property owner
- Property limits including bearings and dimensions
- Existing and proposed structures and parking areas
- Easements, road widening and rights-of-way
- Adjacent street names

4.2 Development Servicing Report: Water

☑ Confirm consistency with Master Servicing Study, if available

☑ Availability of public infrastructure to service proposed development

☑ Identification of system constraints

☑ Identify boundary conditions

☑ Confirmation of adequate domestic supply and pressure

☑ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.

☑ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.

N/A ☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design

☑ Address reliability requirements such as appropriate location of shut-off valves

N/A ☐ Check on the necessity of a pressure zone boundary modification.

☑ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

☑ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.

N/A ☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.

☑ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

☑ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

☑ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).

☑ Confirm consistency with Master Servicing Study and/or justifications for deviations.

☑ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.

☑ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

☑ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)

N/A ☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.

☑ Description of proposed sewer network including sewers, pumping stations, and forcemains.

N/A ☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).

N/A ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.

N/A ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.

N/A ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.

☑ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

☑ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)

☑ Analysis of available capacity in existing public infrastructure.

☑ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

☑ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.

☑ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

☑ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

N/A ☐ Set-back from private sewage disposal systems.

N/A ☐ Watercourse and hazard lands setbacks.

☑ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.

☑ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

- ☑ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- ☑ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- ☑ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.
- ☑ Any proposed diversion of drainage catchment areas from one outlet to another.
- ☑ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- N/A ☐ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.
- ☑ Identification of potential impacts to receiving watercourses
- ☑ Identification of municipal drains and related approval requirements.
- ☑ Descriptions of how the conveyance and storage capacity will be achieved for the development.
- ☑ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.
- N/A ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.
- ☑ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- N/A ☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- N/A ☐ Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

NOTED ☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.

☑ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.

N/A ☐ Changes to Municipal Drains.

N/A ☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

☑ Clearly stated conclusions and recommendations

TBD ☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

☑ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

APPENDIX C

FUS Fire Flow Calculations, WM Boundary Conditions, Schematic of the Hydraulic Model, Hydraulic Modeling Results

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

Novatech #: 113093
Project Name: Ahlul-Bayt Centre, Ottawa
Date: 17-Dec-15
Input By: Stephen Matthews

NOVATECH
Engineers, Planners & Landscape Architects

Legend	
	Input by User
	No Information or Input Required

Building Description: Religious Gathering and Community Centre, 3 Storey building, 3325 GFA

Step			Choose	Multiplier Options	Value Used	Total Fire Flow (L/min)
	Required Fire Flow					
1	**Construction Material**					
	Coefficient related to type of construction C	Wood frame		1.5	1	
		Ordinary construction	Yes	1		
		Non-combustible construction		0.8		
		Fire resistive construction (< 3 hrs)		0.7		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	2675			
		Number of Floors/Storeys	3			
		Gross Floor Area of structure (m^2)			**3,325**	
	F	**Base fire flow without reductions**				**13,000**
		F = 220 C (A)$^{0.5}$				
	Reductions or Surcharges					
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible	Yes	-25%	-25%	**9,750**
		Limited combustible		-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**					
	(2)	Fully Automatic Sprinkler System	No	-50%		***-2,925***
		Adequately Designed System (NFPA 13)	Yes	-30%	-30%	
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**-30%**	
5	***Exposure surcharge (cumulative (%))***					
	(3)	North Side	20.1 - 30 m		10%	**975**
		East Side	> 45.1m		0%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**10%**	
	(1) + (2) + (3)	**Total Required fire Flow, rounded to nearest 1000L/min**			**L/min**	***8,000***
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**133**
				or	USGPM	2,114
		Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	960

Steve Matthews

From:	Francois Thauvette
Sent:	September-02-15 11:24 AM
To:	Steve Matthews
Subject:	FW: Albion Rd N_3095 - Proposed Water Service
Attachments:	3095 Albion Rd Aug 2015.pdf

FYI... Boundary conditions are provided below.

François Thauvette, P. Eng., Project Manager
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x219 | Fax: 613.254.5867

From: Robertson, Syd [mailto:Syd.Robertson@ottawa.ca]
Sent: September-02-15 11:14 AM
To: Francois Thauvette
Subject: FW: Albion Rd N_3095 - Proposed Water Service

Hi François:

The following are boundary conditions, HGL, for hydraulic analysis at 3095 Albion Rd (zone 2C) assumed to be connected to the 152mm on Albion Rd (see attached PDF for location).

Minimum HGL = 123.5m

Maximum HGL = 135.3m

MaxDay (0.74 L/s) + FireFlow (107 L/s) = 120.8m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Summary of the demand data provide by the consultant:

- Proposed Development: Consists of a mosque (place of worship) with adjoining community centre, recreational and athletic facility, and school.
- Amount of fire flow required: 107 L/s
- Average daily demand: 0.16 L/s
- Maximum daily demand: 0.74 L/s
- Maximum hourly daily demand: 1.1 L/s

Syd Robertson, C.E.T.
Project Manager, Infrastructure Approvals
Development Review Services Branch, Urban Outer Core
Planning & Growth Management Department
110 Laurier Ave. W., 4th Floor E
Ottawa, ON K1P 1J1

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27916
ottawa.ca/planning / ottawa.ca/urbanisme

From: Francois Thauvette [mailto:f.thauvette@novatech-eng.com]
Sent: August 27, 2015 12:56 PM
To: Robertson, Syd
Cc: Steve Matthews
Subject: RE: Albion Rd N_3095 - Proposed Water Service

Hi Syd,

Please see responses below in RED. Please review and confirm if the existing 150mm dia. WM in Albion Road N. will provide sufficient fire flow and pressure to accommodate the proposed development. If not, we will need to discuss options (i.e. how to obtain permission to connect to the backbone 600mm dia. WM).

Regards,

François Thauvette, P. Eng., Project Manager
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x219 | Fax: 613.254.5867

From: Robertson, Syd [mailto:Syd.Robertson@ottawa.ca]
Sent: August-27-15 11:39 AM
To: Francois Thauvette
Subject: RE: Albion Rd N_3095 - Proposed Water Service

Hi François:

New connections to backbone mains are prohibited. Connect the proposed water service to the 152mm dia local watermain on Albion Road North.

Please submit a boundary condition request by providing the following information:

1. Proposed location of water service – Connect the proposed 150mm dia. building service to the existing 150mm dia. WM in Albion Road N. (only if adequate), otherwise we will need to discuss options (i.e. connection to the existing 600mm dia. WM). The proposed design assumes using the existing municipal hydrant H047 on plan (370-025) for fire-fighting purposes. No private on-site hydrant is being proposed.

2. Amount of fire flow required. Fire flow = 107 L/s per FUS calculations (attached)
3. Average daily demand: ___ l/s. Average Daily Demand = 0.16 L/s (based on school/community centre use, which exceeds the demand calculated when considering as a place of assembly/worship)
4. Maximum daily demand: ___l/s. Max Day Demand = 0.74 L/s (based on MOE Table 3-3 Peaking Factors)
5. Maximum hourly daily demand: ___ l/s. Peak Hour Demand = 1.1 L/s (based on MOE Table 3-3 Peaking Factors)

Thanks,

Syd Robertson, C.E.T.
Project Manager, Infrastructure Approvals
Development Review Services Branch, Urban Outer Core
Planning & Growth Management Department
110 Laurier Ave. W., 4th Floor E
Ottawa, ON K1P 1J1
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27916
ottawa.ca/planning / ottawa.ca/urbanisme

From: Robertson, Syd
Sent: August 26, 2015 9:29 AM
To: 'Francois Thauvette'
Subject: Albion Rd N_3095 - Proposed Water Service

Hi François:

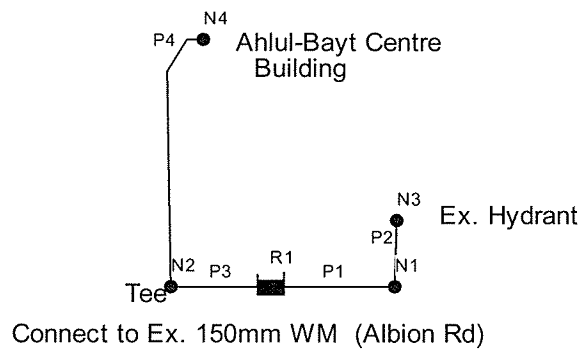
I forwarded your water service inquiry to the City's Environmental Engineering Branch for comments, regarding the proposed connection to the 610mm dia feedermain, in order to achieve the required fire flows. I'll keep you posted on their response.

With regards to the private watermain crossing the subject site, a private easement should be established, in favour of the adjacent property owner, for maintenance and access (if not already in place). Should the private watermain be relocated to the City ROW then a License of Occupation would be required.

Syd Robertson, C.E.T.
Project Manager, Infrastructure Approvals
Development Review Services Branch, Urban Outer Core
Planning & Growth Management Department
110 Laurier Ave. W., 4th Floor E
Ottawa, ON K1P 1J1
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27916
ottawa.ca/planning / ottawa.ca/urbanisme

Boundary Condition for 3095 Albion Rd

Ahlul-Bayt Centre Ottawa - 3095 Albion Road North



Ahlul-Bayt Centre Ottawa

Maximum Day + Fire Flow Demand
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc N1	86.4	0	114.58	28.18	276.45	40.10
Junc N2	86.6	0	120.8	34.2	335.50	48.66
Junc N3	85.8	133	111.83	26.03	255.35	37.04
Junc N4	87.2	0.92	120.8	33.6	329.62	47.81
Resvr R1	120.8	-133.92	120.8	0	0.00	0.00

Maximum Day + Fire Flow Demand
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	12	150	100	133	7.53	518.4
Pipe P2	5.3	150	100	133	7.53	518.4
Pipe P3	1	150	100	0.92	0.05	0.06
Pipe P4	60	150	100	0.92	0.05	0.05

Ahlul-Bayt Centre Ottawa

Peak Hour Demand
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc N1	86.4	0	123.5	37.1	363.95	52.79
Junc N2	86.6	0	123.5	36.9	361.99	52.50
Junc N3	85.8	0	123.5	37.7	369.84	53.64
Junc N4	87.2	1.4	123.49	36.29	356.00	51.63
Resvr R1	123.5	-1.4	123.5	0	0.00	0.00

Peak Hour Demand
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	12	150	100	0	0	0
Pipe P2	5.3	150	100	0	0	0
Pipe P3	1	150	100	1.4	0.08	0.11
Pipe P4	60	150	100	1.4	0.08	0.11

APPENDIX D

SWM Modeling Results (Visual OTTHYMO), IDF Curves, Stage-Storage Tables and Broad Crested Weir Calculations

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

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

        OOO    TTTTT  TTTTT  H   H  Y   Y  M   M   OOO     TM
       O   O     T      T    H   H   Y Y   MM MM  O   O
       O   O     T      T    H   H    Y    M   M  O   O
        OOO      T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
```



```
                   *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\borendorff.NOVATECH\AppData\Local\Temp\828b6ea6-f7be-4f55-aa5c-00940feb087a\Scenari
o.out
  Summary filename:
C:\Users\borendorff.NOVATECH\AppData\Local\Temp\828b6ea6-f7be-4f55-aa5c-00940feb087a\Scenari
o.sum

DATE: 12/23/2015                          TIME: 10:30:53

USER:


COMMENTS: ____________________________________________________________

---------------------------------------------------------------------------------------------
---------------
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\49bed2d9
| Ptotal= 33.89 mm |    Comments: City of Ottawa: 2yr-4hr Chicago (10 minu
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.17    2.05 |  1.17   18.21 |  2.17    5.09 |  3.17    2.46
                 0.33    2.37 |  1.33   76.81 |  2.33    4.29 |  3.33    2.28
                 0.50    2.81 |  1.50   24.08 |  2.50    3.72 |  3.50    2.12
                 0.67    3.50 |  1.67   12.36 |  2.67    3.29 |  3.67    1.99
                 0.83    4.69 |  1.83    8.32 |  2.83    2.95 |  3.83    1.87
                 1.00    7.30 |  2.00    6.30 |  3.00    2.68 |  4.00    1.77

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

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
```



```
     Surface Area     (ha)=       0.07         0.04
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      27.08        40.00
     Mannings n          =       0.013        0.250

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


                            ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.05 | 1.083   18.21 | 2.083    5.09 |  3.08    2.46
               0.167    2.05 | 1.167   18.21 | 2.167    5.09 |  3.17    2.46
               0.250    2.37 | 1.250   76.81 | 2.250    4.29 |  3.25    2.28
               0.333    2.37 | 1.333   76.81 | 2.333    4.29 |  3.33    2.28
               0.417    2.81 | 1.417   24.08 | 2.417    3.72 |  3.42    2.12
               0.500    2.81 | 1.500   24.08 | 2.500    3.72 |  3.50    2.12
               0.583    3.50 | 1.583   12.36 | 2.583    3.29 |  3.58    1.99
               0.667    3.50 | 1.667   12.36 | 2.667    3.29 |  3.67    1.99
               0.750    4.69 | 1.750    8.32 | 2.750    2.95 |  3.75    1.87
               0.833    4.69 | 1.833    8.32 | 2.833    2.95 |  3.83    1.87
               0.917    7.30 | 1.917    6.30 | 2.917    2.68 |  3.92    1.77
               1.000    7.30 | 2.000    6.30 | 3.000    2.68 |  4.00    1.77

     Max.Eff.Inten.(mm/hr)=      76.81        24.82
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.30 (ii)   19.98 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.33         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.013 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58           1.33
     RUNOFF VOLUME    (mm)=      32.32         5.99          19.94
     TOTAL RAINFALL   (mm)=      33.88        33.88          33.88
     RUNOFF COEFFICIENT   =       0.95         0.18           0.59

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.32
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      54.77        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81         1.84
                over (min)        5.00        55.00
     Storage Coeff.  (min)=       1.98 (ii)   54.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.31         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.024 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.17           1.33
     RUNOFF VOLUME    (mm)=      32.31         1.62           9.22
     TOTAL RAINFALL   (mm)=      33.88        33.88          33.88
     RUNOFF COEFFICIENT   =       0.95         0.05           0.27
```

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89         0.51
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     150.55        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81        83.35
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       3.63 (ii)   15.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.25         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.47         0.07          0.490 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58           1.33
     RUNOFF VOLUME    (mm)=      32.31        12.00          25.82
     TOTAL RAINFALL   (mm)=      33.88        33.88          33.88
     RUNOFF COEFFICIENT   =       0.95         0.35           0.76

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.69
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      85.63        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81         4.13
                over (min)        5.00        45.00
     Storage Coeff.  (min)=       2.59 (ii)   40.86 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.29         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.01          0.070 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.00           1.33
     RUNOFF VOLUME    (mm)=      32.31         2.48          11.41
     TOTAL RAINFALL   (mm)=      33.88        33.88          33.88
     RUNOFF COEFFICIENT   =       0.95         0.07           0.34

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



```
       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.11   0.013     1.33    19.94
        + ID2= 2 (0002):     0.45   0.024     1.33     9.22
          ================================================
          ID = 3 (0006):     0.56   0.037     1.33    11.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):     0.56   0.037     1.33    11.33
        + ID2= 2 (0003):     3.40   0.490     1.33    25.82
          ================================================
          ID = 1 (0006):     3.96   0.527     1.33    23.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     3.96   0.527     1.33    23.77
        + ID2= 2 (0004):     1.10   0.070     1.33    11.41
          ================================================
          ID = 3 (0006):     5.06   0.597     1.33    21.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         0.12
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      95.22        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81       201.24
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.76 (ii)   10.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.21         0.04          0.226 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      32.31        16.34          28.00
     TOTAL RAINFALL   (mm)=      33.88        33.88          33.88
```

```
     RUNOFF COEFFICIENT   =       0.95         0.48           0.83

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96         0.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     152.32        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81        83.35
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       3.65 (ii)   15.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.25         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.48         0.07          0.501 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58           1.33
     RUNOFF VOLUME    (mm)=      32.31        12.00          25.82
     TOTAL RAINFALL   (mm)=      33.88        33.88          33.88
     RUNOFF COEFFICIENT   =       0.95         0.35           0.76

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):     1.36   0.226     1.33    28.00
        + ID2= 2 (0009):     3.48   0.501     1.33    25.82
          ==============================================
          ID = 3 (0013):     4.84   0.727     1.33    26.43

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.3000     0.1050
                          0.0070     0.0074   |   0.5300     0.1375
                          0.0074     0.0810   |   1.8000     0.2179
                          0.2000     0.1000   |   0.0000     0.0000

                               AREA     QPEAK     TPEAK       R.V.
```



```
                               (ha)      (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0013)      4.840      0.727      1.33      26.43
     OUTFLOW: ID= 1 (0012)      4.840      0.107      1.92      26.38

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 14.65
                   TIME SHIFT OF PEAK FLOW         (min)= 35.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0909

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.13
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      34.64        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81         1.05
                over (min)        5.00        70.00
     Storage Coeff.  (min)=       1.50 (ii)   67.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.33         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.011 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.42           1.33
     RUNOFF VOLUME    (mm)=      32.31         1.05           9.68
     TOTAL RAINFALL   (mm)=      33.88        33.88          33.88
     RUNOFF COEFFICIENT   =       0.95         0.03           0.29

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.01
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      16.33        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81         1.05
                over (min)        5.00        70.00
     Storage Coeff.  (min)=       0.96 (ii)   67.21 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.007 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.42           1.33
     RUNOFF VOLUME    (mm)=      32.31         1.05          25.40
     TOTAL RAINFALL   (mm)=      33.88        33.88          33.88
     RUNOFF COEFFICIENT   =       0.95         0.03           0.75

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
```

```
          Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
          Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0011):      0.04   0.007     1.33    25.40
       + ID2= 2 (0012):      4.84   0.107     1.92    26.38
         ==================================================
         ID = 3 (0010):      4.88   0.107     1.92    26.37

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 3 (0010):      4.88   0.107     1.92    26.37
       + ID2= 2 (0008):      0.18   0.011     1.33     9.68
         ==================================================
         ID = 1 (0010):      5.06   0.108     1.92    25.77

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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


--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\8fb786b5
| Ptotal= 45.16 mm |    Comments: City of Ottawa: 5yr-4hr Chicago (10 minu
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.17    2.68 |  1.17   24.17 |  2.17    6.69 |  3.17    3.22
                 0.33    3.10 |  1.33  104.19 |  2.33    5.63 |  3.33    2.98
                 0.50    3.68 |  1.50   32.04 |  2.50    4.87 |  3.50    2.77
                 0.67    4.58 |  1.67   16.34 |  2.67    4.30 |  3.67    2.60
                 0.83    6.15 |  1.83   10.96 |  2.83    3.86 |  3.83    2.44
                 1.00    9.61 |  2.00    8.29 |  3.00    3.51 |  4.00    2.31

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

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.07          0.04
    Dep. Storage     (mm)=       1.57          4.67
    Average Slope     (%)=       1.00          0.50
    Length            (m)=      27.08         40.00
    Mannings n          =       0.013         0.250

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



```
                   ---- TRANSFORMED HYETOGRAPH ----
    TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
     hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
   0.083    2.68 | 1.083   24.17 | 2.083    6.69 |  3.08    3.22
   0.167    2.68 | 1.167   24.17 | 2.167    6.69 |  3.17    3.22
   0.250    3.10 | 1.250  104.19 | 2.250    5.63 |  3.25    2.98
   0.333    3.10 | 1.333  104.19 | 2.333    5.63 |  3.33    2.98
   0.417    3.68 | 1.417   32.04 | 2.417    4.87 |  3.42    2.77
   0.500    3.68 | 1.500   32.04 | 2.500    4.87 |  3.50    2.77
   0.583    4.58 | 1.583   16.34 | 2.583    4.30 |  3.58    2.60
   0.667    4.58 | 1.667   16.34 | 2.667    4.30 |  3.67    2.60
   0.750    6.15 | 1.750   10.96 | 2.750    3.86 |  3.75    2.44
   0.833    6.15 | 1.833   10.96 | 2.833    3.86 |  3.83    2.44
   0.917    9.61 | 1.917    8.29 | 2.917    3.51 |  3.92    2.31
   1.000    9.61 | 2.000    8.29 | 3.000    3.51 |  4.00    2.31

    Max.Eff.Inten.(mm/hr)=     104.19        63.85
               over (min)        5.00        15.00
    Storage Coeff.  (min)=       1.15 (ii)   13.95 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.34         0.08
                                                        *TOTALS*
    PEAK FLOW      (cms)=        0.02         0.00         0.019 (iii)
    TIME TO PEAK    (hrs)=       1.33         1.50          1.33
    RUNOFF VOLUME    (mm)=      43.59        13.59         29.49
    TOTAL RAINFALL   (mm)=      45.16        45.16         45.16
    RUNOFF COEFFICIENT   =       0.97         0.30          0.65

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.13          0.32
    Dep. Storage     (mm)=       1.57          4.67
    Average Slope     (%)=       1.00          0.50
    Length            (m)=      54.77         40.00
    Mannings n          =       0.013         0.250

    Max.Eff.Inten.(mm/hr)=     104.19        25.94
               over (min)        5.00        25.00
    Storage Coeff.  (min)=       1.75 (ii)   20.10 (ii)
    Unit Hyd. Tpeak (min)=       5.00        25.00
    Unit Hyd. peak  (cms)=       0.32         0.05
                                                        *TOTALS*
    PEAK FLOW      (cms)=        0.03         0.01         0.035 (iii)
    TIME TO PEAK    (hrs)=       1.33         1.67          1.33
    RUNOFF VOLUME    (mm)=      43.59         8.30         17.12
    TOTAL RAINFALL   (mm)=      45.16        45.16         45.16
    RUNOFF COEFFICIENT   =       0.97         0.18          0.38

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89          0.51
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=     150.55         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     104.19        187.68
                over (min)        5.00         15.00
     Storage Coeff.  (min)=       3.21 (ii)    11.53 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.27          0.09
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.65          0.13          0.714 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.50           1.33
     RUNOFF VOLUME    (mm)=      43.59         21.09          36.39
     TOTAL RAINFALL   (mm)=      45.16         45.16          45.16
     RUNOFF COEFFICIENT   =       0.97          0.47           0.81

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41          0.69
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      85.63         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     104.19         31.67
                over (min)        5.00         20.00
     Storage Coeff.  (min)=       2.29 (ii)    19.23 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.30          0.06
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.09          0.04          0.105 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.58           1.33
     RUNOFF VOLUME    (mm)=      43.59          9.50          19.73
     TOTAL RAINFALL   (mm)=      45.16         45.16          45.16
     RUNOFF COEFFICIENT   =       0.97          0.21           0.44

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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



```
--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.11   0.019     1.33    29.49
        + ID2= 2 (0002):     0.45   0.035     1.33    17.12
          ===============================================
          ID = 3 (0006):     0.56   0.054     1.33    19.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):     0.56   0.054     1.33    19.55
        + ID2= 2 (0003):     3.40   0.714     1.33    36.39
          ===============================================
          ID = 1 (0006):     3.96   0.768     1.33    34.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     3.96   0.768     1.33    34.01
        + ID2= 2 (0004):     1.10   0.105     1.33    19.73
          ===============================================
          ID = 3 (0006):     5.06   0.872     1.33    30.90

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24          0.12
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      95.22         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     104.19        292.88
                over (min)        5.00         10.00
     Storage Coeff.  (min)=       2.44 (ii)     7.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.30          0.14
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.28          0.07          0.347 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      43.59         25.93          38.82
     TOTAL RAINFALL   (mm)=      45.16         45.16          45.16
     RUNOFF COEFFICIENT   =       0.97          0.57           0.86

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0009)  |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96         0.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     152.32        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     104.19       187.68
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.23 (ii)   11.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.09
                                                             *TOTALS*
     PEAK FLOW       (cms)=       0.66         0.14           0.730 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50            1.33
     RUNOFF VOLUME    (mm)=      43.59        21.09           36.39
     TOTAL RAINFALL   (mm)=      45.16        45.16           45.16
     RUNOFF COEFFICIENT   =       0.97         0.47            0.81

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):     1.36   0.347     1.33    38.82
        + ID2= 2 (0009):     3.48   0.730     1.33    36.39
          ===============================================
          ID = 3 (0013):     4.84   1.077     1.33    37.07

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.3000     0.1050
                          0.0070     0.0074   |   0.5300     0.1375
                          0.0074     0.0810   |   1.8000     0.2179
                          0.2000     0.1000   |   0.0000     0.0000

                                AREA     QPEAK     TPEAK        R.V.
                                (ha)     (cms)     (hrs)        (mm)
     INFLOW : ID= 2 (0013)      4.840     1.077      1.33       37.07
     OUTFLOW: ID= 1 (0012)      4.840     0.304      1.58       37.02

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 28.19
                   TIME SHIFT OF PEAK FLOW         (min)= 15.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1059

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



```
--------------------
| CALIB              |
| STANDHYD  (0008)  |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.13
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      34.64        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     104.19        22.50
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       1.33 (ii)   20.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.33         0.05
                                                             *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00           0.015 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.67            1.33
     RUNOFF VOLUME    (mm)=      43.59         7.50           17.60
     TOTAL RAINFALL   (mm)=      45.16        45.16           45.16
     RUNOFF COEFFICIENT   =       0.97         0.17            0.39

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0011)  |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.01
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      16.33        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     104.19        22.50
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       0.85 (ii)   20.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.34         0.05
                                                             *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00           0.009 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.67            1.33
     RUNOFF VOLUME    (mm)=      43.59         7.50           35.65
     TOTAL RAINFALL   (mm)=      45.16        45.16           45.16
     RUNOFF COEFFICIENT   =       0.97         0.17            0.79

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

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

```
| ADD HYD   (0010) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0011):     0.04   0.009     1.33    35.65
        + ID2= 2 (0012):     4.84   0.304     1.58    37.02
          ================================================
          ID = 3 (0010):     4.88   0.305     1.58    37.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0010):     4.88   0.305     1.58    37.01
        + ID2= 2 (0008):     0.18   0.015     1.33    17.60
          ================================================
          ID = 1 (0010):     5.06   0.311     1.58    36.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\bf7a8701
| Ptotal= 76.00 mm |    Comments: City of Ottawa: 100yr-4hr Chicago (10 mi
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.17    4.39 |  1.17   40.65 |  2.17   11.06 |  3.17    5.28
                 0.33    5.07 |  1.33  178.56 |  2.33    9.29 |  3.33    4.88
                 0.50    6.05 |  1.50   54.05 |  2.50    8.02 |  3.50    4.54
                 0.67    7.54 |  1.67   27.32 |  2.67    7.08 |  3.67    4.25
                 0.83   10.16 |  1.83   18.24 |  2.83    6.35 |  3.83    3.99
                 1.00   15.97 |  2.00   13.74 |  3.00    5.76 |  4.00    3.77

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

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.07         0.04
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      27.08        40.00
     Mannings n          =       0.013        0.250

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


                             ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    4.39 | 1.083   40.65 | 2.083   11.06 |  3.08    5.28
                0.167    4.39 | 1.167   40.65 | 2.167   11.06 |  3.17    5.28
                0.250    5.07 | 1.250  178.56 | 2.250    9.29 |  3.25    4.88
                0.333    5.07 | 1.333  178.56 | 2.333    9.29 |  3.33    4.88
                0.417    6.05 | 1.417   54.05 | 2.417    8.02 |  3.42    4.54
                0.500    6.05 | 1.500   54.05 | 2.500    8.02 |  3.50    4.54
```



```
                0.583    7.54 | 1.583   27.32 | 2.583    7.08 |  3.58    4.25
                0.667    7.54 | 1.667   27.32 | 2.667    7.08 |  3.67    4.25
                0.750   10.16 | 1.750   18.24 | 2.750    6.35 |  3.75    3.99
                0.833   10.16 | 1.833   18.24 | 2.833    6.35 |  3.83    3.99
                0.917   15.97 | 1.917   13.74 | 2.917    5.76 |  3.92    3.77
                1.000   15.97 | 2.000   13.74 | 3.000    5.76 |  4.00    3.77

     Max.Eff.Inten.(mm/hr)=     178.56       219.12
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.93 (ii)    8.74 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.12
                                                           *TOTALS*
     PEAK FLOW      (cms)=        0.03         0.01          0.041 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      74.43        38.04         57.33
     TOTAL RAINFALL   (mm)=      76.00        76.00         76.00
     RUNOFF COEFFICIENT   =       0.98         0.50          0.75

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.32
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      54.77        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       135.84
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.41 (ii)   10.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.33         0.09
                                                           *TOTALS*
     PEAK FLOW      (cms)=        0.06         0.06          0.087 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      74.43        30.24         41.28
     TOTAL RAINFALL   (mm)=      76.00        76.00         76.00
     RUNOFF COEFFICIENT   =       0.98         0.40          0.54

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89         0.51
```

```
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     150.55        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       362.98
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.59 (ii)    7.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.13         0.35       1.456 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42        1.33
     RUNOFF VOLUME    (mm)=      74.43        47.58       65.84
     TOTAL RAINFALL   (mm)=      76.00        76.00       76.00
     RUNOFF COEFFICIENT   =       0.98         0.63        0.87

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.69
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      85.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       152.71
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.85 (ii)   10.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.32         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.15       0.238 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50        1.33
     RUNOFF VOLUME    (mm)=      74.43        32.16       44.84
     TOTAL RAINFALL   (mm)=      76.00        76.00       76.00
     RUNOFF COEFFICIENT   =       0.98         0.42        0.59

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.11   0.041     1.33    57.33
        + ID2= 2 (0002):     0.45   0.087     1.33    41.28
          ===============================================
          ID = 3 (0006):     0.56   0.128     1.33    44.43
```



```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):     0.56   0.128     1.33    44.43
        + ID2= 2 (0003):     3.40   1.456     1.33    65.84
          ===============================================
          ID = 1 (0006):     3.96   1.584     1.33    62.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     3.96   1.584     1.33    62.81
        + ID2= 2 (0004):     1.10   0.238     1.33    44.84
          ===============================================
          ID = 3 (0006):     5.06   1.822     1.33    58.90

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         0.12
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      95.22        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       519.91
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.97 (ii)    5.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.49         0.13       0.620 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33        1.33
     RUNOFF VOLUME    (mm)=      74.43        54.05       68.93
     TOTAL RAINFALL   (mm)=      76.00        76.00       76.00
     RUNOFF COEFFICIENT   =       0.98         0.71        0.91

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=       2.96         0.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     152.32        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       362.98
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.61 (ii)    7.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.15         0.35         1.490 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      74.43        47.58         65.84
     TOTAL RAINFALL   (mm)=      76.00        76.00         76.00
     RUNOFF COEFFICIENT   =       0.98         0.63          0.87

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

      (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):     1.36   0.620     1.33    68.93
        + ID2= 2 (0009):     3.48   1.490     1.33    65.84
          =================================================
          ID = 3 (0013):     4.84   2.109     1.33    66.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.3000      0.1050
                          0.0070     0.0074   |   0.5300      0.1375
                          0.0074     0.0810   |   1.8000      0.2179
                          0.2000     0.1000   |   0.0000      0.0000

                               AREA      QPEAK     TPEAK       R.V.
                               (ha)      (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0013)     4.840      2.109      1.33      66.71
     OUTFLOW: ID= 1 (0012)     4.840      0.843      1.50      66.65

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 39.98
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1575

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.13
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
```



```
     Length            (m)=      34.64        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       126.32
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.07 (ii)   10.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.34         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.02         0.036 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      74.43        29.07         41.77
     TOTAL RAINFALL   (mm)=      76.00        76.00         76.00
     RUNOFF COEFFICIENT   =       0.98         0.38          0.55

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

      (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.01
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      16.33        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       126.32
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       0.68 (ii)   10.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.34         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00         0.016 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      74.43        29.07         64.45
     TOTAL RAINFALL   (mm)=      76.00        76.00         76.00
     RUNOFF COEFFICIENT   =       0.98         0.38          0.85

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

      (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0011):     0.04   0.016     1.33    64.45
        + ID2= 2 (0012):     4.84   0.843     1.50    66.65
          =================================================
          ID = 3 (0010):     4.88   0.850     1.50    66.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------
| ADD HYD   (0010) |
|  3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0010):     4.88   0.850     1.50    66.63
        + ID2= 2 (0008):     0.18   0.036     1.33    41.77
          ==================================================
          ID = 1 (0010):     5.06   0.882     1.50    65.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\4c184deb
| Ptotal= 48.47 mm |    Comments: City of Ottawa: 2yr-24hr Chicago (10 min
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.40	6.17	1.37	12.17	1.20	18.17	0.57
0.33	0.41	6.33	1.49	12.33	1.16	18.33	0.56
0.50	0.41	6.50	1.63	12.50	1.13	18.50	0.55
0.67	0.42	6.67	1.82	12.67	1.09	18.67	0.55
0.83	0.43	6.83	2.05	12.83	1.06	18.83	0.54
1.00	0.44	7.00	2.37	13.00	1.03	19.00	0.53
1.17	0.45	7.17	2.81	13.17	1.00	19.17	0.53
1.33	0.46	7.33	3.50	13.33	0.97	19.33	0.52
1.50	0.47	7.50	4.69	13.50	0.95	19.50	0.51
1.67	0.48	7.67	7.30	13.67	0.93	19.67	0.51
1.83	0.49	7.83	18.21	13.83	0.90	19.83	0.50
2.00	0.50	8.00	76.81	14.00	0.88	20.00	0.49
2.17	0.51	8.17	24.08	14.17	0.86	20.17	0.49
2.33	0.52	8.33	12.36	14.33	0.84	20.33	0.48
2.50	0.53	8.50	8.32	14.50	0.82	20.50	0.48
2.67	0.55	8.67	6.30	14.67	0.81	20.67	0.47
2.83	0.56	8.83	5.09	14.83	0.79	20.83	0.47
3.00	0.58	9.00	4.29	15.00	0.78	21.00	0.46
3.17	0.60	9.17	3.72	15.17	0.76	21.17	0.46
3.33	0.61	9.33	3.29	15.33	0.75	21.33	0.45
3.50	0.63	9.50	2.95	15.50	0.73	21.50	0.45
3.67	0.65	9.67	2.68	15.67	0.72	21.67	0.44
3.83	0.67	9.83	2.46	15.83	0.71	21.83	0.44
4.00	0.70	10.00	2.28	16.00	0.69	22.00	0.44
4.17	0.72	10.17	2.12	16.17	0.68	22.17	0.43
4.33	0.75	10.33	1.99	16.33	0.67	22.33	0.43
4.50	0.78	10.50	1.87	16.50	0.66	22.50	0.42
4.67	0.82	10.67	1.77	16.67	0.65	22.67	0.42
4.83	0.85	10.83	1.68	16.83	0.64	22.83	0.42
5.00	0.89	11.00	1.60	17.00	0.63	23.00	0.41
5.17	0.94	11.17	1.52	17.17	0.62	23.17	0.41
5.33	0.99	11.33	1.46	17.33	0.61	23.33	0.40
5.50	1.04	11.50	1.40	17.50	0.60	23.50	0.40
5.67	1.11	11.67	1.34	17.67	0.59	23.67	0.40
5.83	1.18	11.83	1.29	17.83	0.58	23.83	0.39
6.00	1.27	12.00	1.24	18.00	0.58	24.00	0.39

```
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
```



```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.07          0.04
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      27.08         40.00
     Mannings n           =      0.013         0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.40	6.083	1.37	12.083	1.20	18.08	0.57
0.167	0.40	6.167	1.37	12.167	1.20	18.17	0.57
0.250	0.41	6.250	1.49	12.250	1.16	18.25	0.56
0.333	0.41	6.333	1.49	12.333	1.16	18.33	0.56
0.417	0.41	6.417	1.63	12.417	1.13	18.42	0.55
0.500	0.41	6.500	1.63	12.500	1.13	18.50	0.55
0.583	0.42	6.583	1.82	12.583	1.09	18.58	0.55
0.667	0.42	6.667	1.82	12.667	1.09	18.67	0.55
0.750	0.43	6.750	2.05	12.750	1.06	18.75	0.54
0.833	0.43	6.833	2.05	12.833	1.06	18.83	0.54
0.917	0.44	6.917	2.37	12.917	1.03	18.92	0.53
1.000	0.44	7.000	2.37	13.000	1.03	19.00	0.53
1.083	0.45	7.083	2.81	13.083	1.00	19.08	0.53
1.167	0.45	7.167	2.81	13.167	1.00	19.17	0.53
1.250	0.46	7.250	3.50	13.250	0.97	19.25	0.52
1.333	0.46	7.333	3.50	13.333	0.97	19.33	0.52
1.417	0.47	7.417	4.69	13.417	0.95	19.42	0.51
1.500	0.47	7.500	4.69	13.500	0.95	19.50	0.51
1.583	0.48	7.583	7.30	13.583	0.93	19.58	0.51
1.667	0.48	7.667	7.30	13.667	0.93	19.67	0.51
1.750	0.49	7.750	18.21	13.750	0.90	19.75	0.50
1.833	0.49	7.833	18.21	13.833	0.90	19.83	0.50
1.917	0.50	7.917	76.81	13.917	0.88	19.92	0.49
2.000	0.50	8.000	76.81	14.000	0.88	20.00	0.49
2.083	0.51	8.083	24.08	14.083	0.86	20.08	0.49
2.167	0.51	8.167	24.08	14.167	0.86	20.17	0.49
2.250	0.52	8.250	12.36	14.250	0.84	20.25	0.48
2.333	0.52	8.333	12.36	14.333	0.84	20.33	0.48
2.417	0.53	8.417	8.32	14.417	0.82	20.42	0.48
2.500	0.53	8.500	8.32	14.500	0.82	20.50	0.48
2.583	0.55	8.583	6.30	14.583	0.81	20.58	0.47
2.667	0.55	8.667	6.30	14.667	0.81	20.67	0.47
2.750	0.56	8.750	5.09	14.750	0.79	20.75	0.47
2.833	0.56	8.833	5.09	14.833	0.79	20.83	0.47
2.917	0.58	8.917	4.29	14.917	0.78	20.92	0.46
3.000	0.58	9.000	4.29	15.000	0.78	21.00	0.46
3.083	0.60	9.083	3.72	15.083	0.76	21.08	0.46
3.167	0.60	9.167	3.72	15.167	0.76	21.17	0.46
3.250	0.61	9.250	3.29	15.250	0.75	21.25	0.45
3.333	0.61	9.333	3.29	15.333	0.75	21.33	0.45
3.417	0.63	9.417	2.95	15.417	0.73	21.42	0.45
3.500	0.63	9.500	2.95	15.500	0.73	21.50	0.45
3.583	0.65	9.583	2.68	15.583	0.72	21.58	0.44
3.667	0.65	9.667	2.68	15.667	0.72	21.67	0.44
3.750	0.67	9.750	2.46	15.750	0.71	21.75	0.44
3.833	0.67	9.833	2.46	15.833	0.71	21.83	0.44
3.917	0.70	9.917	2.28	15.917	0.69	21.92	0.44
4.000	0.70	10.000	2.28	16.000	0.69	22.00	0.44
4.083	0.72	10.083	2.12	16.083	0.68	22.08	0.43
4.167	0.72	10.167	2.12	16.167	0.68	22.17	0.43
4.250	0.75	10.250	1.99	16.250	0.67	22.25	0.43
4.333	0.75	10.333	1.99	16.333	0.67	22.33	0.43
4.417	0.78	10.417	1.87	16.417	0.66	22.42	0.42
4.500	0.78	10.500	1.87	16.500	0.66	22.50	0.42
4.583	0.82	10.583	1.77	16.583	0.65	22.58	0.42

```
              4.667    0.82 |10.667    1.77 |16.667    0.65 | 22.67    0.42
              4.750    0.85 |10.750    1.68 |16.750    0.64 | 22.75    0.42
              4.833    0.85 |10.833    1.68 |16.833    0.64 | 22.83    0.42
              4.917    0.89 |10.917    1.60 |16.917    0.63 | 22.92    0.41
              5.000    0.89 |11.000    1.60 |17.000    0.63 | 23.00    0.41
              5.083    0.94 |11.083    1.52 |17.083    0.62 | 23.08    0.41
              5.167    0.94 |11.167    1.52 |17.167    0.62 | 23.17    0.41
              5.250    0.99 |11.250    1.46 |17.250    0.61 | 23.25    0.40
              5.333    0.99 |11.333    1.46 |17.333    0.61 | 23.33    0.40
              5.417    1.04 |11.417    1.40 |17.417    0.60 | 23.42    0.40
              5.500    1.04 |11.500    1.40 |17.500    0.60 | 23.50    0.40
              5.583    1.11 |11.583    1.34 |17.583    0.59 | 23.58    0.40
              5.667    1.11 |11.667    1.34 |17.667    0.59 | 23.67    0.40
              5.750    1.18 |11.750    1.29 |17.750    0.58 | 23.75    0.39
              5.833    1.18 |11.833    1.29 |17.833    0.58 | 23.83    0.39
              5.917    1.27 |11.917    1.24 |17.917    0.58 | 23.92    0.39
              6.000    1.27 |12.000    1.24 |18.000    0.58 | 24.00    0.39

     Max.Eff.Inten.(mm/hr)=      76.81        34.62
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.30 (ii)   17.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.33         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.013 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.25          8.00
     RUNOFF VOLUME    (mm)=      46.90         8.50         27.11
     TOTAL RAINFALL   (mm)=      48.47        48.47         48.47
     RUNOFF COEFFICIENT   =       0.97         0.18          0.56

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.32
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      54.77        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81         8.06
                over (min)        5.00        35.00
     Storage Coeff.  (min)=       1.98 (ii)   31.28 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.31         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.024 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.50          8.00
     RUNOFF VOLUME    (mm)=      46.90         3.87         14.63
     TOTAL RAINFALL   (mm)=      48.47        48.47         48.47
     RUNOFF COEFFICIENT   =       0.97         0.08          0.30

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```



```
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89         0.51
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     150.55        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81       137.67
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.63 (ii)   13.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.25         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.47         0.09          0.515 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17          8.00
     RUNOFF VOLUME    (mm)=      46.90        14.88         36.66
     TOTAL RAINFALL   (mm)=      48.47        48.47         48.47
     RUNOFF COEFFICIENT   =       0.97         0.31          0.76

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.69
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      85.63        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81        13.41
                over (min)        5.00        30.00
     Storage Coeff.  (min)=       2.59 (ii)   26.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.29         0.04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.01          0.071 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.42          8.00
     RUNOFF VOLUME    (mm)=      46.90         5.03         17.59
     TOTAL RAINFALL   (mm)=      48.47        48.47         48.47
     RUNOFF COEFFICIENT   =       0.97         0.10          0.36

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    0.11   0.013     8.00    27.11
        + ID2= 2 (0002):    0.45   0.024     8.00    14.63
          ===============================================
          ID = 3 (0006):    0.56   0.038     8.00    17.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):    0.56   0.038     8.00    17.08
        + ID2= 2 (0003):    3.40   0.515     8.00    36.66
          ===============================================
          ID = 1 (0006):    3.96   0.553     8.00    33.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):    3.96   0.553     8.00    33.89
        + ID2= 2 (0004):    1.10   0.071     8.00    17.59
          ===============================================
          ID = 3 (0006):    5.06   0.624     8.00    30.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24          0.12
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      95.22         40.00
     Mannings n          =       0.013         0.250

     Max.Eff.Inten.(mm/hr)=      76.81        216.45
                over (min)       5.00         15.00
     Storage Coeff.  (min)=       2.76 (ii)   10.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.28          0.09
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.21          0.04           0.231 (iii)
     TIME TO PEAK    (hrs)=       8.00          8.17            8.00
     RUNOFF VOLUME    (mm)=      46.90         18.65           39.27
     TOTAL RAINFALL   (mm)=      48.47         48.47           48.47
     RUNOFF COEFFICIENT   =       0.97          0.38            0.81

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
```



```
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96          0.52
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=     152.32         40.00
     Mannings n          =       0.013         0.250

     Max.Eff.Inten.(mm/hr)=      76.81        137.67
                over (min)       5.00         15.00
     Storage Coeff.  (min)=       3.65 (ii)   13.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.25          0.08
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.48          0.09           0.527 (iii)
     TIME TO PEAK    (hrs)=       8.00          8.17            8.00
     RUNOFF VOLUME    (mm)=      46.90         14.88           36.66
     TOTAL RAINFALL   (mm)=      48.47         48.47           48.47
     RUNOFF COEFFICIENT   =       0.97          0.31            0.76

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):    1.36   0.231     8.00    39.27
        + ID2= 2 (0009):    3.48   0.527     8.00    36.66
          ===============================================
          ID = 3 (0013):    4.84   0.757     8.00    37.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           0.0000     0.0000   |   0.3000     0.1050
                           0.0070     0.0074   |   0.5300     0.1375
                           0.0074     0.0810   |   1.8000     0.2179
                           0.2000     0.1000   |   0.0000     0.0000

                               AREA     QPEAK     TPEAK        R.V.
                               (ha)     (cms)     (hrs)        (mm)
     INFLOW : ID= 2 (0013)     4.840     0.757      8.00       37.39
     OUTFLOW: ID= 1 (0012)     4.840     0.159      8.42       37.34

                  PEAK   FLOW    REDUCTION [Qout/Qin](%)= 21.00
                  TIME SHIFT OF PEAK FLOW         (min)= 25.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0960
```

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.13
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      34.64        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81         5.29
                over (min)        5.00        40.00
     Storage Coeff.  (min)=       1.50 (ii)   36.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.33         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00         0.011 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.58          8.00
     RUNOFF VOLUME    (mm)=      46.90         3.09         14.15
     TOTAL RAINFALL   (mm)=      48.47        48.47         48.47
     RUNOFF COEFFICIENT   =       0.97         0.06          0.29

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.01
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      16.33        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      76.81         5.29
                over (min)        5.00        40.00
     Storage Coeff.  (min)=       0.96 (ii)   35.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00         0.007 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.58          8.00
     RUNOFF VOLUME    (mm)=      46.90         3.09         31.61
     TOTAL RAINFALL   (mm)=      48.47        48.47         48.47
     RUNOFF COEFFICIENT   =       0.97         0.06          0.65

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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



```
--------------------
| ADD HYD   (0010) |
|   1 +  2 =  3    |          AREA    QPEAK     TPEAK     R.V.
--------------------          (ha)    (cms)     (hrs)     (mm)
          ID1= 1 (0011):      0.04    0.007     8.00     31.61
        + ID2= 2 (0012):      4.84    0.159     8.42     37.34
          ===============================================
          ID = 3 (0010):      4.88    0.160     8.42     37.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |          AREA    QPEAK     TPEAK     R.V.
--------------------          (ha)    (cms)     (hrs)     (mm)
          ID1= 3 (0010):      4.88    0.160     8.42     37.29
        + ID2= 2 (0008):      0.18    0.011     8.00     14.15
          ===============================================
          ID = 1 (0010):      5.06    0.162     8.42     36.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\b9b06878
| Ptotal= 64.13 mm |    Comments: City of Ottawa: 5yr-24hr Chicago (10 min
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.52	6.17	1.78	12.17	1.57	18.17	0.74
0.33	0.53	6.33	1.94	12.33	1.51	18.33	0.73
0.50	0.54	6.50	2.13	12.50	1.47	18.50	0.72
0.67	0.55	6.67	2.37	12.67	1.42	18.67	0.71
0.83	0.56	6.83	2.68	12.83	1.38	18.83	0.70
1.00	0.57	7.00	3.10	13.00	1.34	19.00	0.69
1.17	0.58	7.17	3.68	13.17	1.30	19.17	0.68
1.33	0.59	7.33	4.58	13.33	1.27	19.33	0.67
1.50	0.60	7.50	6.15	13.50	1.24	19.50	0.66
1.67	0.62	7.67	9.61	13.67	1.20	19.67	0.66
1.83	0.63	7.83	24.17	13.83	1.17	19.83	0.65
2.00	0.64	8.00	104.19	14.00	1.15	20.00	0.64
2.17	0.66	8.17	32.04	14.17	1.12	20.17	0.63
2.33	0.68	8.33	16.34	14.33	1.10	20.33	0.63
2.50	0.69	8.50	10.96	14.50	1.07	20.50	0.62
2.67	0.71	8.67	8.29	14.67	1.05	20.67	0.61
2.83	0.73	8.83	6.69	14.83	1.03	20.83	0.61
3.00	0.75	9.00	5.63	15.00	1.01	21.00	0.60
3.17	0.77	9.17	4.87	15.17	0.99	21.17	0.59
3.33	0.80	9.33	4.30	15.33	0.97	21.33	0.59
3.50	0.82	9.50	3.86	15.50	0.95	21.50	0.58
3.67	0.85	9.67	3.51	15.67	0.93	21.67	0.58
3.83	0.88	9.83	3.22	15.83	0.92	21.83	0.57
4.00	0.91	10.00	2.98	16.00	0.90	22.00	0.56
4.17	0.94	10.17	2.77	16.17	0.88	22.17	0.56
4.33	0.98	10.33	2.60	16.33	0.87	22.33	0.55
4.50	1.02	10.50	2.44	16.50	0.86	22.50	0.55
4.67	1.06	10.67	2.31	16.67	0.84	22.67	0.54
4.83	1.11	10.83	2.19	16.83	0.83	22.83	0.54
5.00	1.16	11.00	2.08	17.00	0.82	23.00	0.53
5.17	1.22	11.17	1.99	17.17	0.80	23.17	0.53

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
5.33	1.28	11.33	1.90	17.33	0.79	23.33	0.52
5.50	1.36	11.50	1.82	17.50	0.78	23.50	0.52
5.67	1.44	11.67	1.75	17.67	0.77	23.67	0.51
5.83	1.54	11.83	1.68	17.83	0.76	23.83	0.51
6.00	1.65	12.00	1.62	18.00	0.75	24.00	0.51

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

--------------------
| CALIB              |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.07          0.04
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      27.08         40.00
     Mannings n           =      0.013         0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.52	6.083	1.78	12.083	1.57	18.08	0.74
0.167	0.52	6.167	1.78	12.167	1.57	18.17	0.74
0.250	0.53	6.250	1.94	12.250	1.51	18.25	0.73
0.333	0.53	6.333	1.94	12.333	1.51	18.33	0.73
0.417	0.54	6.417	2.13	12.417	1.47	18.42	0.72
0.500	0.54	6.500	2.13	12.500	1.47	18.50	0.72
0.583	0.55	6.583	2.37	12.583	1.42	18.58	0.71
0.667	0.55	6.667	2.37	12.667	1.42	18.67	0.71
0.750	0.56	6.750	2.68	12.750	1.38	18.75	0.70
0.833	0.56	6.833	2.68	12.833	1.38	18.83	0.70
0.917	0.57	6.917	3.10	12.917	1.34	18.92	0.69
1.000	0.57	7.000	3.10	13.000	1.34	19.00	0.69
1.083	0.58	7.083	3.68	13.083	1.30	19.08	0.68
1.167	0.58	7.167	3.68	13.167	1.30	19.17	0.68
1.250	0.59	7.250	4.58	13.250	1.27	19.25	0.67
1.333	0.59	7.333	4.58	13.333	1.27	19.33	0.67
1.417	0.60	7.417	6.15	13.417	1.24	19.42	0.66
1.500	0.60	7.500	6.15	13.500	1.24	19.50	0.66
1.583	0.62	7.583	9.61	13.583	1.20	19.58	0.66
1.667	0.62	7.667	9.61	13.667	1.20	19.67	0.66
1.750	0.63	7.750	24.17	13.750	1.17	19.75	0.65
1.833	0.63	7.833	24.17	13.833	1.17	19.83	0.65
1.917	0.64	7.917	104.19	13.917	1.15	19.92	0.64
2.000	0.64	8.000	104.19	14.000	1.15	20.00	0.64
2.083	0.66	8.083	32.04	14.083	1.12	20.08	0.63
2.167	0.66	8.167	32.04	14.167	1.12	20.17	0.63
2.250	0.68	8.250	16.34	14.250	1.10	20.25	0.63
2.333	0.68	8.333	16.34	14.333	1.10	20.33	0.63
2.417	0.69	8.417	10.96	14.417	1.07	20.42	0.62
2.500	0.69	8.500	10.96	14.500	1.07	20.50	0.62
2.583	0.71	8.583	8.29	14.583	1.05	20.58	0.61
2.667	0.71	8.667	8.29	14.667	1.05	20.67	0.61
2.750	0.73	8.750	6.69	14.750	1.03	20.75	0.61
2.833	0.73	8.833	6.69	14.833	1.03	20.83	0.61
2.917	0.75	8.917	5.63	14.917	1.01	20.92	0.60
3.000	0.75	9.000	5.63	15.000	1.01	21.00	0.60
3.083	0.77	9.083	4.87	15.083	0.99	21.08	0.59
3.167	0.77	9.167	4.87	15.167	0.99	21.17	0.59
3.250	0.80	9.250	4.30	15.250	0.97	21.25	0.59
3.333	0.80	9.333	4.30	15.333	0.97	21.33	0.59
3.417	0.82	9.417	3.86	15.417	0.95	21.42	0.58
3.500	0.82	9.500	3.86	15.500	0.95	21.50	0.58
3.583	0.85	9.583	3.51	15.583	0.93	21.58	0.58
3.667	0.85	9.667	3.51	15.667	0.93	21.67	0.58

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
3.750	0.88	9.750	3.22	15.750	0.92	21.75	0.57
3.833	0.88	9.833	3.22	15.833	0.92	21.83	0.57
3.917	0.91	9.917	2.98	15.917	0.90	21.92	0.56
4.000	0.91	10.000	2.98	16.000	0.90	22.00	0.56
4.083	0.94	10.083	2.77	16.083	0.88	22.08	0.56
4.167	0.94	10.167	2.77	16.167	0.88	22.17	0.56
4.250	0.98	10.250	2.60	16.250	0.87	22.25	0.55
4.333	0.98	10.333	2.60	16.333	0.87	22.33	0.55
4.417	1.02	10.417	2.44	16.417	0.86	22.42	0.55
4.500	1.02	10.500	2.44	16.500	0.86	22.50	0.55
4.583	1.06	10.583	2.31	16.583	0.84	22.58	0.54
4.667	1.06	10.667	2.31	16.667	0.84	22.67	0.54
4.750	1.11	10.750	2.19	16.750	0.83	22.75	0.54
4.833	1.11	10.833	2.19	16.833	0.83	22.83	0.54
4.917	1.16	10.917	2.08	16.917	0.82	22.92	0.53
5.000	1.16	11.000	2.08	17.000	0.82	23.00	0.53
5.083	1.22	11.083	1.99	17.083	0.80	23.08	0.53
5.167	1.22	11.167	1.99	17.167	0.80	23.17	0.53
5.250	1.28	11.250	1.90	17.250	0.79	23.25	0.52
5.333	1.28	11.333	1.90	17.333	0.79	23.33	0.52
5.417	1.36	11.417	1.82	17.417	0.78	23.42	0.52
5.500	1.36	11.500	1.82	17.500	0.78	23.50	0.52
5.583	1.44	11.583	1.75	17.583	0.77	23.58	0.51
5.667	1.44	11.667	1.75	17.667	0.77	23.67	0.51
5.750	1.54	11.750	1.68	17.750	0.76	23.75	0.51
5.833	1.54	11.833	1.68	17.833	0.76	23.83	0.51
5.917	1.65	11.917	1.62	17.917	0.75	23.92	0.51
6.000	1.65	12.000	1.62	18.000	0.75	24.00	0.51

```
     Max.Eff.Inten.(mm/hr)=     104.19         79.97
                over (min)        5.00         15.00
     Storage Coeff.  (min)=       1.15 (ii)    12.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.34          0.08
                                                           *TOTALS*
     PEAK FLOW      (cms)=        0.02          0.01          0.019 (iii)
     TIME TO PEAK    (hrs)=       8.00          8.17           8.00
     RUNOFF VOLUME    (mm)=      62.56         17.30          40.26
     TOTAL RAINFALL   (mm)=      64.13         64.13          64.13
     RUNOFF COEFFICIENT   =       0.98          0.27           0.63

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13          0.32
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      54.77         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     104.19         35.61
                over (min)        5.00         20.00
     Storage Coeff.  (min)=       1.75 (ii)    17.92 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.32          0.06
                                                           *TOTALS*
     PEAK FLOW      (cms)=        0.03          0.02          0.038 (iii)
```

```
     TIME TO PEAK    (hrs)=       8.00        8.25          8.00
     RUNOFF VOLUME    (mm)=      62.56       11.57         24.32
     TOTAL RAINFALL   (mm)=      64.13       64.13         64.13
     RUNOFF COEFFICIENT   =       0.98        0.18          0.38

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89        0.51
     Dep. Storage     (mm)=       1.57        4.67
     Average Slope     (%)=       1.00        0.50
     Length            (m)=     150.55       40.00
     Mannings n          =      0.013       0.250

     Max.Eff.Inten.(mm/hr)=     104.19      207.94
                over (min)       5.00       15.00
     Storage Coeff.  (min)=       3.21 (ii)   11.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00       15.00
     Unit Hyd. peak  (cms)=       0.27        0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.65        0.15          0.732 (iii)
     TIME TO PEAK    (hrs)=       8.00        8.17          8.00
     RUNOFF VOLUME    (mm)=      62.56       24.24         50.30
     TOTAL RAINFALL   (mm)=      64.13       64.13         64.13
     RUNOFF COEFFICIENT   =       0.98        0.38          0.78

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41        0.69
     Dep. Storage     (mm)=       1.57        4.67
     Average Slope     (%)=       1.00        0.50
     Length            (m)=      85.63       40.00
     Mannings n          =      0.013       0.250

     Max.Eff.Inten.(mm/hr)=     104.19       49.24
                over (min)       5.00       20.00
     Storage Coeff.  (min)=       2.29 (ii)   16.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00       20.00
     Unit Hyd. peak  (cms)=       0.30        0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.09        0.05          0.110 (iii)
     TIME TO PEAK    (hrs)=       8.00        8.25          8.00
     RUNOFF VOLUME    (mm)=      62.56       12.87         27.77
```



```
     TOTAL RAINFALL   (mm)=      64.13       64.13         64.13
     RUNOFF COEFFICIENT   =       0.98        0.20          0.43

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.11   0.019     8.00    40.26
        + ID2= 2 (0002):     0.45   0.038     8.00    24.32
          ==================================================
          ID = 3 (0006):     0.56   0.057     8.00    27.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):     0.56   0.057     8.00    27.45
        + ID2= 2 (0003):     3.40   0.732     8.00    50.30
          ==================================================
          ID = 1 (0006):     3.96   0.790     8.00    47.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     3.96   0.790     8.00    47.06
        + ID2= 2 (0004):     1.10   0.110     8.00    27.77
          ==================================================
          ID = 3 (0006):     5.06   0.899     8.00    42.87

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24        0.12
     Dep. Storage     (mm)=       1.57        4.67
     Average Slope     (%)=       1.00        0.50
     Length            (m)=      95.22       40.00
     Mannings n          =      0.013       0.250

     Max.Eff.Inten.(mm/hr)=     104.19      299.22
                over (min)       5.00       10.00
     Storage Coeff.  (min)=       2.44 (ii)    7.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00       10.00
     Unit Hyd. peak  (cms)=       0.30        0.14
                                                        *TOTALS*
```

```
     PEAK FLOW       (cms)=       0.28          0.07          0.351 (iii)
     TIME TO PEAK    (hrs)=       8.00          8.08           8.00
     RUNOFF VOLUME    (mm)=      62.56         28.41          53.34
     TOTAL RAINFALL   (mm)=      64.13         64.13          64.13
     RUNOFF COEFFICIENT   =       0.98          0.44           0.83

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96          0.52
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=     152.32         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     104.19        207.94
                over (min)       5.00         15.00
     Storage Coeff.  (min)=       3.23 (ii)   11.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.27          0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.66          0.16          0.749 (iii)
     TIME TO PEAK    (hrs)=       8.00          8.17           8.00
     RUNOFF VOLUME    (mm)=      62.56         24.24          50.30
     TOTAL RAINFALL   (mm)=      64.13         64.13          64.13
     RUNOFF COEFFICIENT   =       0.98          0.38           0.78

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):    1.36   0.351     8.00    53.34
        + ID2= 2 (0009):    3.48   0.749     8.00    50.30
          ================================================
          ID = 3 (0013):    4.84   1.100     8.00    51.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.3000      0.1050
                          0.0070     0.0074   |   0.5300      0.1375
```



```
                          0.0074     0.0810   |   1.8000      0.2179
                          0.2000     0.1000   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0013)      4.840     1.100      8.00      51.15
     OUTFLOW: ID= 1 (0012)      4.840     0.359      8.25      51.10

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 32.66
                   TIME SHIFT OF PEAK FLOW        (min)= 15.00
                   MAXIMUM  STORAGE   USED      (ha.m.)=  0.1136

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05          0.13
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      34.64         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     104.19         31.98
                over (min)       5.00         20.00
     Storage Coeff.  (min)=       1.33 (ii)   18.21 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.33          0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01          0.01          0.017 (iii)
     TIME TO PEAK    (hrs)=       8.00          8.25           8.00
     RUNOFF VOLUME    (mm)=      62.56         10.68          24.29
     TOTAL RAINFALL   (mm)=      64.13         64.13          64.13
     RUNOFF COEFFICIENT   =       0.98          0.17           0.38

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03          0.01
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      16.33         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     104.19         31.98
                over (min)       5.00         20.00
     Storage Coeff.  (min)=       0.85 (ii)   17.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.34          0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01          0.00          0.009 (iii)
     TIME TO PEAK    (hrs)=       8.00          8.25           8.00
     RUNOFF VOLUME    (mm)=      62.56         10.68          45.33
     TOTAL RAINFALL   (mm)=      64.13         64.13          64.13
     RUNOFF COEFFICIENT   =       0.98          0.17           0.71
```

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0011):     0.04    0.009     8.00    45.33
        + ID2= 2 (0012):     4.84    0.359     8.25    51.10
          ===================================================
          ID = 3 (0010):     4.88    0.361     8.25    51.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0010):     4.88    0.361     8.25    51.05
        + ID2= 2 (0008):     0.18    0.017     8.00    24.29
          ===================================================
          ID = 1 (0010):     5.06    0.371     8.25    50.10

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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


--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\042c2aeb
| Ptotal=106.74 mm |    Comments: City of Ottawa: 100yr-24hr Chicago (10 m
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.17    0.83 |  6.17    2.90 | 12.17    2.55 | 18.17    1.19
                 0.33    0.85 |  6.33    3.16 | 12.33    2.46 | 18.33    1.17
                 0.50    0.86 |  6.50    3.48 | 12.50    2.38 | 18.50    1.16
                 0.67    0.88 |  6.67    3.88 | 12.67    2.31 | 18.67    1.14
                 0.83    0.90 |  6.83    4.39 | 12.83    2.24 | 18.83    1.13
                 1.00    0.91 |  7.00    5.07 | 13.00    2.18 | 19.00    1.11
                 1.17    0.93 |  7.17    6.05 | 13.17    2.12 | 19.17    1.10
                 1.33    0.95 |  7.33    7.54 | 13.33    2.06 | 19.33    1.09
                 1.50    0.97 |  7.50   10.16 | 13.50    2.01 | 19.50    1.07
                 1.67    0.99 |  7.67   15.97 | 13.67    1.96 | 19.67    1.06
                 1.83    1.02 |  7.83   40.65 | 13.83    1.91 | 19.83    1.05
                 2.00    1.04 |  8.00  178.56 | 14.00    1.86 | 20.00    1.04
                 2.17    1.07 |  8.17   54.05 | 14.17    1.82 | 20.17    1.02
                 2.33    1.09 |  8.33   27.32 | 14.33    1.78 | 20.33    1.01
                 2.50    1.12 |  8.50   18.24 | 14.50    1.74 | 20.50    1.00
                 2.67    1.15 |  8.67   13.74 | 14.67    1.70 | 20.67    0.99
                 2.83    1.18 |  8.83   11.06 | 14.83    1.67 | 20.83    0.98
                 3.00    1.21 |  9.00    9.29 | 15.00    1.63 | 21.00    0.97
                 3.17    1.25 |  9.17    8.02 | 15.17    1.60 | 21.17    0.96
                 3.33    1.29 |  9.33    7.08 | 15.33    1.57 | 21.33    0.95
```



```
                 3.50    1.33 |  9.50    6.35 | 15.50    1.54 | 21.50    0.94
                 3.67    1.37 |  9.67    5.76 | 15.67    1.51 | 21.67    0.93
                 3.83    1.42 |  9.83    5.28 | 15.83    1.48 | 21.83    0.92
                 4.00    1.47 | 10.00    4.88 | 16.00    1.46 | 22.00    0.91
                 4.17    1.52 | 10.17    4.54 | 16.17    1.43 | 22.17    0.90
                 4.33    1.58 | 10.33    4.25 | 16.33    1.41 | 22.33    0.89
                 4.50    1.65 | 10.50    3.99 | 16.50    1.39 | 22.50    0.88
                 4.67    1.72 | 10.67    3.77 | 16.67    1.36 | 22.67    0.88
                 4.83    1.80 | 10.83    3.57 | 16.83    1.34 | 22.83    0.87
                 5.00    1.88 | 11.00    3.40 | 17.00    1.32 | 23.00    0.86
                 5.17    1.98 | 11.17    3.24 | 17.17    1.30 | 23.17    0.85
                 5.33    2.09 | 11.33    3.10 | 17.33    1.28 | 23.33    0.84
                 5.50    2.21 | 11.50    2.97 | 17.50    1.26 | 23.50    0.84
                 5.67    2.34 | 11.67    2.85 | 17.67    1.24 | 23.67    0.83
                 5.83    2.50 | 11.83    2.74 | 17.83    1.23 | 23.83    0.82
                 6.00    2.69 | 12.00    2.64 | 18.00    1.21 | 24.00    0.81

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

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.07          0.04
     Dep. Storage     (mm)=     1.57          4.67
     Average Slope     (%)=     1.00          0.50
     Length            (m)=    27.08         40.00
     Mannings n           =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    0.83 | 6.083    2.90 |12.083    2.55 | 18.08    1.19
                0.167    0.83 | 6.167    2.90 |12.167    2.55 | 18.17    1.19
                0.250    0.85 | 6.250    3.16 |12.250    2.46 | 18.25    1.17
                0.333    0.85 | 6.333    3.16 |12.333    2.46 | 18.33    1.17
                0.417    0.86 | 6.417    3.48 |12.417    2.38 | 18.42    1.16
                0.500    0.86 | 6.500    3.48 |12.500    2.38 | 18.50    1.16
                0.583    0.88 | 6.583    3.88 |12.583    2.31 | 18.58    1.14
                0.667    0.88 | 6.667    3.88 |12.667    2.31 | 18.67    1.14
                0.750    0.90 | 6.750    4.39 |12.750    2.24 | 18.75    1.13
                0.833    0.90 | 6.833    4.39 |12.833    2.24 | 18.83    1.13
                0.917    0.91 | 6.917    5.07 |12.917    2.18 | 18.92    1.11
                1.000    0.91 | 7.000    5.07 |13.000    2.18 | 19.00    1.11
                1.083    0.93 | 7.083    6.05 |13.083    2.12 | 19.08    1.10
                1.167    0.93 | 7.167    6.05 |13.167    2.12 | 19.17    1.10
                1.250    0.95 | 7.250    7.54 |13.250    2.06 | 19.25    1.09
                1.333    0.95 | 7.333    7.54 |13.333    2.06 | 19.33    1.09
                1.417    0.97 | 7.417   10.16 |13.417    2.01 | 19.42    1.07
                1.500    0.97 | 7.500   10.16 |13.500    2.01 | 19.50    1.07
                1.583    0.99 | 7.583   15.97 |13.583    1.96 | 19.58    1.06
                1.667    0.99 | 7.667   15.97 |13.667    1.96 | 19.67    1.06
                1.750    1.02 | 7.750   40.65 |13.750    1.91 | 19.75    1.05
                1.833    1.02 | 7.833   40.66 |13.833    1.91 | 19.83    1.05
                1.917    1.04 | 7.917  178.56 |13.917    1.86 | 19.92    1.04
                2.000    1.04 | 8.000  178.55 |14.000    1.86 | 20.00    1.04
                2.083    1.07 | 8.083   54.05 |14.083    1.82 | 20.08    1.02
                2.167    1.07 | 8.167   54.05 |14.167    1.82 | 20.17    1.02
                2.250    1.09 | 8.250   27.32 |14.250    1.78 | 20.25    1.01
                2.333    1.09 | 8.333   27.32 |14.333    1.78 | 20.33    1.01
                2.417    1.12 | 8.417   18.24 |14.417    1.74 | 20.42    1.00
                2.500    1.12 | 8.500   18.24 |14.500    1.74 | 20.50    1.00
                2.583    1.15 | 8.583   13.74 |14.583    1.70 | 20.58    0.99
                2.667    1.15 | 8.667   13.74 |14.667    1.70 | 20.67    0.99
                2.750    1.18 | 8.750   11.06 |14.750    1.67 | 20.75    0.98
```

```
   2.833    1.18 | 8.833   11.06 |14.833    1.67 | 20.83    0.98
   2.917    1.21 | 8.917    9.29 |14.917    1.63 | 20.92    0.97
   3.000    1.21 | 9.000    9.29 |15.000    1.63 | 21.00    0.97
   3.083    1.25 | 9.083    8.02 |15.083    1.60 | 21.08    0.96
   3.167    1.25 | 9.167    8.02 |15.167    1.60 | 21.17    0.96
   3.250    1.29 | 9.250    7.08 |15.250    1.57 | 21.25    0.95
   3.333    1.29 | 9.333    7.08 |15.333    1.57 | 21.33    0.95
   3.417    1.33 | 9.417    6.35 |15.417    1.54 | 21.42    0.94
   3.500    1.33 | 9.500    6.35 |15.500    1.54 | 21.50    0.94
   3.583    1.37 | 9.583    5.76 |15.583    1.51 | 21.58    0.93
   3.667    1.37 | 9.667    5.76 |15.667    1.51 | 21.67    0.93
   3.750    1.42 | 9.750    5.28 |15.750    1.48 | 21.75    0.92
   3.833    1.42 | 9.833    5.28 |15.833    1.48 | 21.83    0.92
   3.917    1.47 | 9.917    4.88 |15.917    1.46 | 21.92    0.91
   4.000    1.47 |10.000    4.88 |16.000    1.46 | 22.00    0.91
   4.083    1.52 |10.083    4.54 |16.083    1.43 | 22.08    0.90
   4.167    1.52 |10.167    4.54 |16.167    1.43 | 22.17    0.90
   4.250    1.58 |10.250    4.25 |16.250    1.41 | 22.25    0.89
   4.333    1.58 |10.333    4.25 |16.333    1.41 | 22.33    0.89
   4.417    1.65 |10.417    3.99 |16.417    1.39 | 22.42    0.88
   4.500    1.65 |10.500    3.99 |16.500    1.39 | 22.50    0.88
   4.583    1.72 |10.583    3.77 |16.583    1.36 | 22.58    0.88
   4.667    1.72 |10.667    3.77 |16.667    1.36 | 22.67    0.88
   4.750    1.80 |10.750    3.57 |16.750    1.34 | 22.75    0.87
   4.833    1.80 |10.833    3.57 |16.833    1.34 | 22.83    0.87
   4.917    1.88 |10.917    3.40 |16.917    1.32 | 22.92    0.86
   5.000    1.88 |11.000    3.40 |17.000    1.32 | 23.00    0.86
   5.083    1.98 |11.083    3.24 |17.083    1.30 | 23.08    0.85
   5.167    1.98 |11.167    3.24 |17.167    1.30 | 23.17    0.85
   5.250    2.09 |11.250    3.10 |17.250    1.28 | 23.25    0.84
   5.333    2.09 |11.333    3.10 |17.333    1.28 | 23.33    0.84
   5.417    2.21 |11.417    2.97 |17.417    1.26 | 23.42    0.84
   5.500    2.21 |11.500    2.97 |17.500    1.26 | 23.50    0.84
   5.583    2.34 |11.583    2.85 |17.583    1.24 | 23.58    0.83
   5.667    2.34 |11.667    2.85 |17.667    1.24 | 23.67    0.83
   5.750    2.50 |11.750    2.74 |17.750    1.23 | 23.75    0.82
   5.833    2.50 |11.833    2.74 |17.833    1.23 | 23.83    0.82
   5.917    2.69 |11.917    2.64 |17.917    1.21 | 23.92    0.81
   6.000    2.69 |12.000    2.64 |18.000    1.21 | 24.00    0.81

     Max.Eff.Inten.(mm/hr)=     178.56       232.76
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.93 (ii)    8.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.12
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.02          0.043 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.08           8.00
     RUNOFF VOLUME    (mm)=     105.17        42.99          75.94
     TOTAL RAINFALL   (mm)=     106.74       106.74         106.74
     RUNOFF COEFFICIENT   =       0.99         0.40           0.71

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.32
     Dep. Storage     (mm)=       1.57         4.67
```



```
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      54.77        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       164.71
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.41 (ii)   10.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.33         0.10
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.08          0.097 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17           8.00
     RUNOFF VOLUME    (mm)=     105.17        36.33          53.54
     TOTAL RAINFALL   (mm)=     106.74       106.74         106.74
     RUNOFF COEFFICIENT   =       0.99         0.34           0.50

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89         0.51
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     150.55        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       367.67
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.59 (ii)    7.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.14
                                                           *TOTALS*
     PEAK FLOW       (cms)=       1.13         0.36          1.472 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.08           8.00
     RUNOFF VOLUME    (mm)=     105.17        51.26          87.92
     TOTAL RAINFALL   (mm)=     106.74       106.74         106.74
     RUNOFF COEFFICIENT   =       0.99         0.48           0.82

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.69
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      85.63        40.00
```

```
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       182.05
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.85 (ii)   10.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.32         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.18         0.260 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17          8.00
     RUNOFF VOLUME    (mm)=     105.17        37.94         58.11
     TOTAL RAINFALL   (mm)=     106.74       106.74        106.74
     RUNOFF COEFFICIENT   =       0.99         0.36          0.54

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.11   0.043     8.00    75.94
        + ID2= 2 (0002):     0.45   0.097     8.00    53.54
          ===============================================
          ID = 3 (0006):     0.56   0.140     8.00    57.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):     0.56   0.140     8.00    57.94
        + ID2= 2 (0003):     3.40   1.472     8.00    87.92
          ===============================================
          ID = 1 (0006):     3.96   1.612     8.00    83.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     3.96   1.612     8.00    83.68
        + ID2= 2 (0004):     1.10   0.260     8.00    58.11
          ===============================================
          ID = 3 (0006):     5.06   1.872     8.00    78.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         0.12
```


Detailed Output.txt

```
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      95.22        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       522.47
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.97 (ii)    5.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.49         0.13         0.621 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.00          8.00
     RUNOFF VOLUME    (mm)=     105.17        57.03         92.17
     TOTAL RAINFALL   (mm)=     106.74       106.74        106.74
     RUNOFF COEFFICIENT   =       0.99         0.53          0.86

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96         0.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     152.32        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     178.56       367.67
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.61 (ii)    7.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.15         0.37         1.506 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.08          8.00
     RUNOFF VOLUME    (mm)=     105.17        51.26         87.92
     TOTAL RAINFALL   (mm)=     106.74       106.74        106.74
     RUNOFF COEFFICIENT   =       0.99         0.48          0.82

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):     1.36   0.621     8.00    92.17
        + ID2= 2 (0009):     3.48   1.506     8.00    87.92
          ===============================================
          ID = 3 (0013):     4.84   2.127     8.00    89.12
```

```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           0.0000     0.0000   |   0.3000      0.1050
                           0.0070     0.0074   |   0.5300      0.1375
                           0.0074     0.0810   |   1.8000      0.2179
                           0.2000     0.1000   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0013)       4.840     2.127      8.00      89.12
     OUTFLOW: ID= 1 (0012)       4.840     0.998      8.17      89.06

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 46.92
                   TIME SHIFT OF PEAK FLOW        (min)= 10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1691

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05          0.13
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      34.64         40.00
     Mannings n          =       0.013         0.250

     Max.Eff.Inten.(mm/hr)=     178.56        154.14
                over (min)        5.00         15.00
     Storage Coeff.  (min)=       1.07 (ii)    10.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.34          0.10
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.02          0.03          0.040 (iii)
     TIME TO PEAK    (hrs)=       8.00          8.17          8.00
     RUNOFF VOLUME    (mm)=     105.17         35.22         54.81
     TOTAL RAINFALL   (mm)=     106.74        106.74        106.74
     RUNOFF COEFFICIENT   =       0.99          0.33          0.51

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03          0.01
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      16.33         40.00
     Mannings n          =       0.013         0.250
```



```
     Max.Eff.Inten.(mm/hr)=     178.56        154.14
                over (min)        5.00         10.00
     Storage Coeff.  (min)=       0.68 (ii)     9.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.34          0.11
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.02          0.00          0.017 (iii)
     TIME TO PEAK    (hrs)=       8.00          8.08          8.00
     RUNOFF VOLUME    (mm)=     105.17         35.22         85.67
     TOTAL RAINFALL   (mm)=     106.74        106.74        106.74
     RUNOFF COEFFICIENT   =       0.99          0.33          0.80

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK      R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
          ID1= 1 (0011):     0.04    0.017     8.00     85.67
        + ID2= 2 (0012):     4.84    0.998     8.17     89.06
          ===============================================
          ID = 3 (0010):     4.88    1.005     8.17     89.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK      R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
          ID1= 3 (0010):     4.88    1.005     8.17     89.03
        + ID2= 2 (0008):     0.18    0.040     8.00     54.81
          ===============================================
          ID = 1 (0010):     5.06    1.041     8.17     87.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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


--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\db64f3b1
| Ptotal= 42.34 mm |    Comments: City of Ottawa: 2yr-12hr SCS (30 minute
--------------------
                 TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                  hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
                 0.50     1.27 |  3.50     1.69 |  6.50     9.23 |  9.50     1.27
                 1.00     0.59 |  4.00     1.69 |  7.00     4.06 | 10.00     1.02
                 1.50     1.10 |  4.50     2.29 |  7.50     2.71 | 10.50     1.44
                 2.00     1.10 |  5.00     2.88 |  8.00     2.37 | 11.00     0.93
                 2.50     1.44 |  5.50     4.57 |  8.50     1.86 | 11.50     0.85
                 3.00     1.27 |  6.00    36.24 |  9.00     1.95 | 12.00     0.85

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

```
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.07         0.04
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      27.08        40.00
     Mannings n          =       0.013        0.250

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


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.27 | 3.083    1.69 | 6.083    9.23 |  9.08    1.27
               0.167    1.27 | 3.167    1.69 | 6.167    9.23 |  9.17    1.27
               0.250    1.27 | 3.250    1.69 | 6.250    9.23 |  9.25    1.27
               0.333    1.27 | 3.333    1.69 | 6.333    9.23 |  9.33    1.27
               0.417    1.27 | 3.417    1.69 | 6.417    9.23 |  9.42    1.27
               0.500    1.27 | 3.500    1.69 | 6.500    9.23 |  9.50    1.27
               0.583    0.59 | 3.583    1.69 | 6.583    4.06 |  9.58    1.02
               0.667    0.59 | 3.667    1.69 | 6.667    4.06 |  9.67    1.02
               0.750    0.59 | 3.750    1.69 | 6.750    4.06 |  9.75    1.02
               0.833    0.59 | 3.833    1.69 | 6.833    4.06 |  9.83    1.02
               0.917    0.59 | 3.917    1.69 | 6.917    4.06 |  9.92    1.02
               1.000    0.59 | 4.000    1.69 | 7.000    4.06 | 10.00    1.02
               1.083    1.10 | 4.083    2.29 | 7.083    2.71 | 10.08    1.44
               1.167    1.10 | 4.167    2.29 | 7.167    2.71 | 10.17    1.44
               1.250    1.10 | 4.250    2.29 | 7.250    2.71 | 10.25    1.44
               1.333    1.10 | 4.333    2.29 | 7.333    2.71 | 10.33    1.44
               1.417    1.10 | 4.417    2.29 | 7.417    2.71 | 10.42    1.44
               1.500    1.10 | 4.500    2.29 | 7.500    2.71 | 10.50    1.44
               1.583    1.10 | 4.583    2.88 | 7.583    2.37 | 10.58    0.93
               1.667    1.10 | 4.667    2.88 | 7.667    2.37 | 10.67    0.93
               1.750    1.10 | 4.750    2.88 | 7.750    2.37 | 10.75    0.93
               1.833    1.10 | 4.833    2.88 | 7.833    2.37 | 10.83    0.93
               1.917    1.10 | 4.917    2.88 | 7.917    2.37 | 10.92    0.93
               2.000    1.10 | 5.000    2.88 | 8.000    2.37 | 11.00    0.93
               2.083    1.44 | 5.083    4.57 | 8.083    1.86 | 11.08    0.85
               2.167    1.44 | 5.167    4.57 | 8.167    1.86 | 11.17    0.85
               2.250    1.44 | 5.250    4.57 | 8.250    1.86 | 11.25    0.85
               2.333    1.44 | 5.333    4.57 | 8.333    1.86 | 11.33    0.85
               2.417    1.44 | 5.417    4.57 | 8.417    1.86 | 11.42    0.85
               2.500    1.44 | 5.500    4.57 | 8.500    1.86 | 11.50    0.85
               2.583    1.27 | 5.583   36.24 | 8.583    1.95 | 11.58    0.85
               2.667    1.27 | 5.667   36.24 | 8.667    1.95 | 11.67    0.85
               2.750    1.27 | 5.750   36.24 | 8.750    1.95 | 11.75    0.85
               2.833    1.27 | 5.833   36.24 | 8.833    1.95 | 11.83    0.85
               2.917    1.27 | 5.917   36.24 | 8.917    1.95 | 11.92    0.85
               3.000    1.27 | 6.000   36.24 | 9.000    1.95 | 12.00    0.85

     Max.Eff.Inten.(mm/hr)=      36.24        28.20
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.75 (ii)   19.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.32         0.06
                                                         *TOTALS*
     PEAK FLOW      (cms)=        0.01         0.00        0.007 (iii)
     TIME TO PEAK    (hrs)=       5.92         6.17         6.00
     RUNOFF VOLUME    (mm)=      40.76         6.80        24.80
     TOTAL RAINFALL   (mm)=      42.33        42.33        42.33
     RUNOFF COEFFICIENT   =       0.96         0.16         0.59

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
```



```
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.32
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      54.77        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      36.24         1.32
                over (min)        5.00        65.00
     Storage Coeff.  (min)=       2.67 (ii)   63.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.29         0.02
                                                         *TOTALS*
     PEAK FLOW      (cms)=        0.01         0.00        0.011 (iii)
     TIME TO PEAK    (hrs)=       6.00         7.00         6.00
     RUNOFF VOLUME    (mm)=      40.76         1.27        11.13
     TOTAL RAINFALL   (mm)=      42.33        42.33        42.33
     RUNOFF COEFFICIENT   =       0.96         0.03         0.26

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89         0.51
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     150.55        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      36.24        62.77
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.90 (ii)   17.79 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.22         0.06
                                                         *TOTALS*
     PEAK FLOW      (cms)=        0.23         0.06        0.284 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08         6.00
     RUNOFF VOLUME    (mm)=      40.76        13.68        32.10
     TOTAL RAINFALL   (mm)=      42.33        42.33        42.33
     RUNOFF COEFFICIENT   =       0.96         0.32         0.76

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
```

```
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.69
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      85.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      36.24         4.44
                over (min)        5.00        45.00
     Storage Coeff.  (min)=       3.49 (ii)   40.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.26         0.03
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01        0.034 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.67         6.00
     RUNOFF VOLUME    (mm)=      40.76         2.66        14.09
     TOTAL RAINFALL   (mm)=      42.33        42.33        42.33
     RUNOFF COEFFICIENT   =       0.96         0.06         0.33

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.11   0.007     6.00    24.80
        + ID2= 2 (0002):     0.45   0.011     6.00    11.13
          ===============================================
          ID = 3 (0006):     0.56   0.018     6.00    13.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):     0.56   0.018     6.00    13.82
        + ID2= 2 (0003):     3.40   0.284     6.00    32.10
          ===============================================
          ID = 1 (0006):     3.96   0.302     6.00    29.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```



```
          ID1= 1 (0006):     3.96   0.302     6.00    29.51
        + ID2= 2 (0004):     1.10   0.034     6.00    14.09
          ===============================================
          ID = 3 (0006):     5.06   0.336     6.00    26.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         0.12
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      95.22        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      36.24        95.38
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.72 (ii)   14.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.25         0.08
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.02        0.124 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08         6.00
     RUNOFF VOLUME    (mm)=      40.76        16.73        34.27
     TOTAL RAINFALL   (mm)=      42.33        42.33        42.33
     RUNOFF COEFFICIENT   =       0.96         0.40         0.81

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96         0.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     152.32        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      36.24        62.77
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.94 (ii)   17.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.22         0.06
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.06        0.290 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08         6.00
     RUNOFF VOLUME    (mm)=      40.76        13.68        32.10
     TOTAL RAINFALL   (mm)=      42.33        42.33        42.33
     RUNOFF COEFFICIENT   =       0.96         0.32         0.76

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
```

```
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):     1.36   0.124     6.00    34.27
        + ID2= 2 (0009):     3.48   0.290     6.00    32.10
          ===============================================
          ID = 3 (0013):     4.84   0.415     6.00    32.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.3000      0.1050
                          0.0070     0.0074   |   0.5300      0.1375
                          0.0074     0.0810   |   1.8000      0.2179
                          0.2000     0.1000   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0013)     4.840     0.415      6.00      32.71
     OUTFLOW: ID= 1 (0012)     4.840     0.130      6.42      32.65

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 31.30
                  TIME SHIFT OF PEAK FLOW         (min)= 25.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0931

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.13
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      34.64        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      36.24         0.41
                over (min)        5.00       100.00
     Storage Coeff.  (min)=       2.03 (ii)   98.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00       100.00
     Unit Hyd. peak  (cms)=       0.31         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.005 (iii)
     TIME TO PEAK    (hrs)=       5.92         7.58           6.00
     RUNOFF VOLUME    (mm)=      40.76         0.41          11.70
     TOTAL RAINFALL   (mm)=      42.33        42.33          42.33
     RUNOFF COEFFICIENT   =       0.96         0.01           0.28

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```



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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.01
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      16.33        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      36.24         0.41
                over (min)        5.00       100.00
     Storage Coeff.  (min)=       1.29 (ii)   97.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00       100.00
     Unit Hyd. peak  (cms)=       0.33         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.003 (iii)
     TIME TO PEAK    (hrs)=       5.83         7.58           6.00
     RUNOFF VOLUME    (mm)=      40.76         0.41          30.85
     TOTAL RAINFALL   (mm)=      42.33        42.33          42.33
     RUNOFF COEFFICIENT   =       0.96         0.01           0.73

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0011):     0.04   0.003     6.00    30.85
        + ID2= 2 (0012):     4.84   0.130     6.42    32.65
          ===============================================
          ID = 3 (0010):     4.88   0.131     6.42    32.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0010):     4.88   0.131     6.42    32.64
        + ID2= 2 (0008):     0.18   0.005     6.00    11.70
          ===============================================
          ID = 1 (0010):     5.06   0.132     6.42    31.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   8 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
```

```
|                  |             ata\Local\Temp\
|                  |             828b6ea6-f7be-4f55-aa5c-00940feb087a\5ec04b5c
| Ptotal= 56.19 mm |    Comments: City of Ottawa: 5yr-12hr SCS (30 minute
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	1.69	3.50	2.25	6.50	12.25	9.50	1.69
1.00	0.79	4.00	2.25	7.00	5.39	10.00	1.35
1.50	1.46	4.50	3.03	7.50	3.60	10.50	1.91
2.00	1.46	5.00	3.82	8.00	3.15	11.00	1.24
2.50	1.91	5.50	6.07	8.50	2.47	11.50	1.12
3.00	1.69	6.00	48.08	9.00	2.58	12.00	1.12

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

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.07         0.04
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      27.08        40.00
     Mannings n          =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.69	3.083	2.25	6.083	12.25	9.08	1.69
0.167	1.69	3.167	2.25	6.167	12.25	9.17	1.69
0.250	1.69	3.250	2.25	6.250	12.25	9.25	1.69
0.333	1.69	3.333	2.25	6.333	12.25	9.33	1.69
0.417	1.69	3.417	2.25	6.417	12.25	9.42	1.69
0.500	1.69	3.500	2.25	6.500	12.25	9.50	1.69
0.583	0.79	3.583	2.25	6.583	5.39	9.58	1.35
0.667	0.79	3.667	2.25	6.667	5.39	9.67	1.35
0.750	0.79	3.750	2.25	6.750	5.39	9.75	1.35
0.833	0.79	3.833	2.25	6.833	5.39	9.83	1.35
0.917	0.79	3.917	2.25	6.917	5.39	9.92	1.35
1.000	0.79	4.000	2.25	7.000	5.39	10.00	1.35
1.083	1.46	4.083	3.03	7.083	3.60	10.08	1.91
1.167	1.46	4.167	3.03	7.167	3.60	10.17	1.91
1.250	1.46	4.250	3.03	7.250	3.60	10.25	1.91
1.333	1.46	4.333	3.03	7.333	3.60	10.33	1.91
1.417	1.46	4.417	3.03	7.417	3.60	10.42	1.91
1.500	1.46	4.500	3.03	7.500	3.60	10.50	1.91
1.583	1.46	4.583	3.82	7.583	3.15	10.58	1.24
1.667	1.46	4.667	3.82	7.667	3.15	10.67	1.24
1.750	1.46	4.750	3.82	7.750	3.15	10.75	1.24
1.833	1.46	4.833	3.82	7.833	3.15	10.83	1.24
1.917	1.46	4.917	3.82	7.917	3.15	10.92	1.24
2.000	1.46	5.000	3.82	8.000	3.15	11.00	1.24
2.083	1.91	5.083	6.07	8.083	2.47	11.08	1.12
2.167	1.91	5.167	6.07	8.167	2.47	11.17	1.12
2.250	1.91	5.250	6.07	8.250	2.47	11.25	1.12
2.333	1.91	5.333	6.07	8.333	2.47	11.33	1.12
2.417	1.91	5.417	6.07	8.417	2.47	11.42	1.12
2.500	1.91	5.500	6.07	8.500	2.47	11.50	1.12
2.583	1.69	5.583	48.08	8.583	2.58	11.58	1.12
2.667	1.69	5.667	48.08	8.667	2.58	11.67	1.12
2.750	1.69	5.750	48.08	8.750	2.58	11.75	1.12
2.833	1.69	5.833	48.08	8.833	2.58	11.83	1.12
2.917	1.69	5.917	48.08	8.917	2.58	11.92	1.12
3.000	1.69	6.000	48.08	9.000	2.58	12.00	1.12


```
     Max.Eff.Inten.(mm/hr)=      48.08        50.89
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.56 (ii)   15.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.33         0.07
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.011 (iii)
     TIME TO PEAK    (hrs)=       5.83         6.08          6.00
     RUNOFF VOLUME    (mm)=      54.61        15.39         36.18
     TOTAL RAINFALL   (mm)=      56.18        56.18         56.18
     RUNOFF COEFFICIENT   =       0.97         0.27          0.64

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.32
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      54.77        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      48.08        28.20
               over (min)        5.00        25.00
     Storage Coeff.  (min)=       2.39 (ii)   20.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.30         0.05
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.022 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.25          6.00
     RUNOFF VOLUME    (mm)=      54.61         9.02         20.42
     TOTAL RAINFALL   (mm)=      56.18        56.18         56.18
     RUNOFF COEFFICIENT   =       0.97         0.16          0.36

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89         0.51
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     150.55        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      48.08        89.15
               over (min)        5.00        20.00
```

```
     Storage Coeff.  (min)=       4.38 (ii)   15.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.23         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.31         0.09         0.392 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08          6.00
     RUNOFF VOLUME    (mm)=      54.61        21.68         44.07
     TOTAL RAINFALL   (mm)=      56.18        56.18         56.18
     RUNOFF COEFFICIENT   =       0.97         0.39          0.78

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.69
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      85.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      48.08        34.64
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       3.12 (ii)   19.47 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.27         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.04         0.071 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.17          6.00
     RUNOFF VOLUME    (mm)=      54.61        10.39         23.66
     TOTAL RAINFALL   (mm)=      56.18        56.18         56.18
     RUNOFF COEFFICIENT   =       0.97         0.18          0.42

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    0.11    0.011     6.00    36.18
        + ID2= 2 (0002):    0.45    0.022     6.00    20.42
          ===============================================
          ID = 3 (0006):    0.56    0.033     6.00    23.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
```



```
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):    0.56    0.033     6.00    23.51
        + ID2= 2 (0003):    3.40    0.392     6.00    44.07
          ===============================================
          ID = 1 (0006):    3.96    0.425     6.00    41.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):    3.96    0.425     6.00    41.17
        + ID2= 2 (0004):    1.10    0.071     6.00    23.66
          ===============================================
          ID = 3 (0006):    5.06    0.496     6.00    37.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         0.12
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      95.22        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      48.08       131.03
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.32 (ii)   12.93 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.26         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.04         0.169 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=      54.61        25.50         46.75
     TOTAL RAINFALL   (mm)=      56.18        56.18         56.18
     RUNOFF COEFFICIENT   =       0.97         0.45          0.83

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96         0.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     152.32        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      48.08        89.15
```

```
              over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.41 (ii)   15.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.23         0.07
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.32         0.09        0.401 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08         6.00
     RUNOFF VOLUME    (mm)=      54.61        21.68        44.07
     TOTAL RAINFALL   (mm)=      56.18        56.18        56.18
     RUNOFF COEFFICIENT   =       0.97         0.39         0.78

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):     1.36   0.169     6.00    46.75
        + ID2= 2 (0009):     3.48   0.401     6.00    44.07
          ===============================================
          ID = 3 (0013):     4.84   0.571     6.00    44.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.3000     0.1050
                          0.0070     0.0074   |   0.5300     0.1375
                          0.0074     0.0810   |   1.8000     0.2179
                          0.2000     0.1000   |   0.0000     0.0000

                             AREA     QPEAK     TPEAK       R.V.
                             (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0013)      4.840      0.571      6.00      44.83
     OUTFLOW: ID= 1 (0012)      4.840      0.313      6.08      44.77

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 54.82
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1072

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.13
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      34.64        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      48.08        24.30
              over (min)        5.00        25.00
     Storage Coeff.  (min)=       1.81 (ii)   20.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
```



```
     Unit Hyd. peak  (cms)=       0.32         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00        0.009 (iii)
     TIME TO PEAK    (hrs)=       5.92         6.25         6.00
     RUNOFF VOLUME    (mm)=      54.61         8.10        21.12
     TOTAL RAINFALL   (mm)=      56.18        56.18        56.18
     RUNOFF COEFFICIENT   =       0.97         0.14         0.38

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.01
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      16.33        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      48.08        24.30
              over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.15 (ii)   19.99 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.34         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00        0.004 (iii)
     TIME TO PEAK    (hrs)=       5.75         6.17         6.00
     RUNOFF VOLUME    (mm)=      54.61         8.10        43.51
     TOTAL RAINFALL   (mm)=      56.18        56.18        56.18
     RUNOFF COEFFICIENT   =       0.97         0.14         0.77

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0011):     0.04   0.004     6.00    43.51
        + ID2= 2 (0012):     4.84   0.313     6.08    44.77
          ===============================================
          ID = 3 (0010):     4.88   0.314     6.08    44.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
        ID1= 3 (0010):     4.88   0.314     6.08    44.76
      + ID2= 2 (0008):     0.18   0.009     6.00    21.12
        ===============================================
        ID = 1 (0010):     5.06   0.320     6.08    43.92

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   9 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\7f8e32f0
| Ptotal= 93.91 mm |    Comments: City of Ottawa: 100yr-12hr SCS (30 minut
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.50    2.82 |  3.50    3.76 |  6.50   20.47 |  9.50    2.82
                 1.00    1.31 |  4.00    3.76 |  7.00    9.02 | 10.00    2.25
                 1.50    2.44 |  4.50    5.07 |  7.50    6.01 | 10.50    3.19
                 2.00    2.44 |  5.00    6.39 |  8.00    5.26 | 11.00    2.07
                 2.50    3.19 |  5.50   10.14 |  8.50    4.13 | 11.50    1.88
                 3.00    2.82 |  6.00   80.38 |  9.00    4.32 | 12.00    1.88

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

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.07          0.04
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      27.08         40.00
     Mannings n          =       0.013         0.250

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


                              ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    2.82 | 3.083    3.76 | 6.083   20.47 |  9.08    2.82
                0.167    2.82 | 3.167    3.76 | 6.167   20.47 |  9.17    2.82
                0.250    2.82 | 3.250    3.76 | 6.250   20.47 |  9.25    2.82
                0.333    2.82 | 3.333    3.76 | 6.333   20.47 |  9.33    2.82
                0.417    2.82 | 3.417    3.76 | 6.417   20.47 |  9.42    2.82
                0.500    2.82 | 3.500    3.76 | 6.500   20.47 |  9.50    2.82
                0.583    1.31 | 3.583    3.76 | 6.583    9.02 |  9.58    2.25
                0.667    1.31 | 3.667    3.76 | 6.667    9.02 |  9.67    2.25
                0.750    1.31 | 3.750    3.76 | 6.750    9.02 |  9.75    2.25
                0.833    1.31 | 3.833    3.76 | 6.833    9.02 |  9.83    2.25
                0.917    1.31 | 3.917    3.76 | 6.917    9.02 |  9.92    2.25
                1.000    1.31 | 4.000    3.76 | 7.000    9.02 | 10.00    2.25
                1.083    2.44 | 4.083    5.07 | 7.083    6.01 | 10.08    3.19
                1.167    2.44 | 4.167    5.07 | 7.167    6.01 | 10.17    3.19
                1.250    2.44 | 4.250    5.07 | 7.250    6.01 | 10.25    3.19
                1.333    2.44 | 4.333    5.07 | 7.333    6.01 | 10.33    3.19
                1.417    2.44 | 4.417    5.07 | 7.417    6.01 | 10.42    3.19
                1.500    2.44 | 4.500    5.07 | 7.500    6.01 | 10.50    3.19
                1.583    2.44 | 4.583    6.39 | 7.583    5.26 | 10.58    2.07
                1.667    2.44 | 4.667    6.39 | 7.667    5.26 | 10.67    2.07
                1.750    2.44 | 4.750    6.39 | 7.750    5.26 | 10.75    2.07
                1.833    2.44 | 4.833    6.39 | 7.833    5.26 | 10.83    2.07
```



```
                1.917    2.44 | 4.917    6.39 | 7.917    5.26 | 10.92    2.07
                2.000    2.44 | 5.000    6.39 | 8.000    5.26 | 11.00    2.07
                2.083    3.19 | 5.083   10.14 | 8.083    4.13 | 11.08    1.88
                2.167    3.19 | 5.167   10.14 | 8.167    4.13 | 11.17    1.88
                2.250    3.19 | 5.250   10.14 | 8.250    4.13 | 11.25    1.88
                2.333    3.19 | 5.333   10.14 | 8.333    4.13 | 11.33    1.88
                2.417    3.19 | 5.417   10.14 | 8.417    4.13 | 11.42    1.88
                2.500    3.19 | 5.500   10.14 | 8.500    4.13 | 11.50    1.88
                2.583    2.82 | 5.583   80.38 | 8.583    4.32 | 11.58    1.88
                2.667    2.82 | 5.667   80.38 | 8.667    4.32 | 11.67    1.88
                2.750    2.82 | 5.750   80.38 | 8.750    4.32 | 11.75    1.88
                2.833    2.82 | 5.833   80.38 | 8.833    4.32 | 11.83    1.88
                2.917    2.82 | 5.917   80.38 | 8.917    4.32 | 11.92    1.88
                3.000    2.82 | 6.000   80.38 | 9.000    4.32 | 12.00    1.88

     Max.Eff.Inten.(mm/hr)=      80.38        97.80
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.27 (ii)   12.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.33         0.09
                                                          *TOTALS*
     PEAK FLOW      (cms)=        0.01         0.01          0.021 (iii)
     TIME TO PEAK    (hrs)=       5.83         6.00           6.00
     RUNOFF VOLUME    (mm)=      92.34        37.42          66.53
     TOTAL RAINFALL   (mm)=      93.91        93.91          93.91
     RUNOFF COEFFICIENT   =       0.98         0.40           0.71

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13          0.32
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      54.77         40.00
     Mannings n          =       0.013         0.250

     Max.Eff.Inten.(mm/hr)=      80.38        69.63
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.94 (ii)   14.31 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.08
                                                          *TOTALS*
     PEAK FLOW      (cms)=        0.03         0.05          0.071 (iii)
     TIME TO PEAK    (hrs)=       5.92         6.08           6.00
     RUNOFF VOLUME    (mm)=      92.34        32.35          47.34
     TOTAL RAINFALL   (mm)=      93.91        93.91          93.91
     RUNOFF COEFFICIENT   =       0.98         0.34           0.50

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89          0.51
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=     150.55         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      80.38        158.27
                over (min)        5.00         15.00
     Storage Coeff.  (min)=       3.56 (ii)    12.47 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.26          0.08
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.52          0.19         0.706 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.00          6.00
     RUNOFF VOLUME    (mm)=      92.34         45.47         77.34
     TOTAL RAINFALL   (mm)=      93.91         93.91         93.91
     RUNOFF COEFFICIENT   =       0.98          0.48          0.82

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41          0.69
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      85.63         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      80.38         75.50
                over (min)        5.00         15.00
     Storage Coeff.  (min)=       2.54 (ii)    14.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.29          0.08
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.07          0.11         0.181 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.08          6.00
     RUNOFF VOLUME    (mm)=      92.34         33.75         51.33
     TOTAL RAINFALL   (mm)=      93.91         93.91         93.91
     RUNOFF COEFFICIENT   =       0.98          0.36          0.55

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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



```
--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.11   0.021     6.00    66.53
        + ID2= 2 (0002):     0.45   0.071     6.00    47.34
          ==================================================
          ID = 3 (0006):     0.56   0.093     6.00    51.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):     0.56   0.093     6.00    51.11
        + ID2= 2 (0003):     3.40   0.706     6.00    77.34
          ==================================================
          ID = 1 (0006):     3.96   0.799     6.00    73.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     3.96   0.799     6.00    73.63
        + ID2= 2 (0004):     1.10   0.181     6.00    51.33
          ==================================================
          ID = 3 (0006):     5.06   0.980     6.00    68.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24          0.12
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      95.22         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      80.38        227.94
                over (min)        5.00         15.00
     Storage Coeff.  (min)=       2.71 (ii)    10.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.29          0.09
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.22          0.07         0.292 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.00          6.00
     RUNOFF VOLUME    (mm)=      92.34         52.20         81.50
     TOTAL RAINFALL   (mm)=      93.91         93.91         93.91
     RUNOFF COEFFICIENT   =       0.98          0.56          0.87

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96         0.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     152.32        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      80.38       158.27
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.59 (ii)   12.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.26         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.53         0.19          0.722 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      92.34        45.47          77.34
     TOTAL RAINFALL   (mm)=      93.91        93.91          93.91
     RUNOFF COEFFICIENT   =       0.98         0.48           0.82

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):     1.36   0.292     6.00    81.50
        + ID2= 2 (0009):     3.48   0.722     6.00    77.34
          ===============================================
          ID = 3 (0013):     4.84   1.014     6.00    78.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.3000     0.1050
                          0.0070     0.0074   |   0.5300     0.1375
                          0.0074     0.0810   |   1.8000     0.2179
                          0.2000     0.1000   |   0.0000     0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0013)      4.840      1.014      6.00      78.51
     OUTFLOW: ID= 1 (0012)      4.840      0.748      6.08      78.46

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 73.75
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1539

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



```
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.13
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      34.64        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      80.38        66.07
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.48 (ii)   14.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.33         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.02          0.029 (iii)
     TIME TO PEAK    (hrs)=       5.83         6.08           6.00
     RUNOFF VOLUME    (mm)=      92.34        31.36          48.43
     TOTAL RAINFALL   (mm)=      93.91        93.91          93.91
     RUNOFF COEFFICIENT   =       0.98         0.33           0.52

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.01
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      16.33        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      80.38        66.07
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       0.94 (ii)   13.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.34         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.008 (iii)
     TIME TO PEAK    (hrs)=       5.75         6.08           6.00
     RUNOFF VOLUME    (mm)=      92.34        31.36          78.92
     TOTAL RAINFALL   (mm)=      93.91        93.91          93.91
     RUNOFF COEFFICIENT   =       0.98         0.33           0.84

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0010) |
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0011):     0.04   0.008     6.00    78.92
        + ID2= 2 (0012):     4.84   0.748     6.08    78.46
          ===============================================
          ID = 3 (0010):     4.88   0.751     6.08    78.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0010):     4.88   0.751     6.08    78.46
        + ID2= 2 (0008):     0.18   0.029     6.00    48.43
          ===============================================
          ID = 1 (0010):     5.06   0.772     6.08    77.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:  10 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\fdc36da6
| Ptotal= 48.47 mm |    Comments: City of Ottawa: 2yr-24hr SCS (60 minute
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 1.00    0.73 |  7.00    0.97 | 13.00    5.28 | 19.00    0.73
                 2.00    0.34 |  8.00    0.97 | 14.00    2.33 | 20.00    0.58
                 3.00    0.63 |  9.00    1.31 | 15.00    1.55 | 21.00    0.82
                 4.00    0.63 | 10.00    1.65 | 16.00    1.36 | 22.00    0.53
                 5.00    0.82 | 11.00    2.62 | 17.00    1.07 | 23.00    0.48
                 6.00    0.73 | 12.00   20.75 | 18.00    1.11 | 24.00    0.48

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

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        0.07          0.04
     Dep. Storage     (mm)=        1.57          4.67
     Average Slope     (%)=        1.00          0.50
     Length            (m)=       27.08         40.00
     Mannings n          =       0.013         0.250

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


                                ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    0.73 | 6.083    0.97 |12.083    5.28 | 18.08    0.73
                0.167    0.73 | 6.167    0.97 |12.167    5.28 | 18.17    0.73
                0.250    0.73 | 6.250    0.97 |12.250    5.28 | 18.25    0.73
                0.333    0.73 | 6.333    0.97 |12.333    5.28 | 18.33    0.73
                0.417    0.73 | 6.417    0.97 |12.417    5.28 | 18.42    0.73
                0.500    0.73 | 6.500    0.97 |12.500    5.28 | 18.50    0.73
                0.583    0.73 | 6.583    0.97 |12.583    5.28 | 18.58    0.73
```



```
                0.667    0.73 | 6.667    0.97 |12.667    5.28 | 18.67    0.73
                0.750    0.73 | 6.750    0.97 |12.750    5.28 | 18.75    0.73
                0.833    0.73 | 6.833    0.97 |12.833    5.28 | 18.83    0.73
                0.917    0.73 | 6.917    0.97 |12.917    5.28 | 18.92    0.73
                1.000    0.73 | 7.000    0.97 |13.000    5.28 | 19.00    0.73
                1.083    0.34 | 7.083    0.97 |13.083    2.33 | 19.08    0.58
                1.167    0.34 | 7.167    0.97 |13.167    2.33 | 19.17    0.58
                1.250    0.34 | 7.250    0.97 |13.250    2.33 | 19.25    0.58
                1.333    0.34 | 7.333    0.97 |13.333    2.33 | 19.33    0.58
                1.417    0.34 | 7.417    0.97 |13.417    2.33 | 19.42    0.58
                1.500    0.34 | 7.500    0.97 |13.500    2.33 | 19.50    0.58
                1.583    0.34 | 7.583    0.97 |13.583    2.33 | 19.58    0.58
                1.667    0.34 | 7.667    0.97 |13.667    2.33 | 19.67    0.58
                1.750    0.34 | 7.750    0.97 |13.750    2.33 | 19.75    0.58
                1.833    0.34 | 7.833    0.97 |13.833    2.33 | 19.83    0.58
                1.917    0.34 | 7.917    0.97 |13.917    2.33 | 19.92    0.58
                2.000    0.34 | 8.000    0.97 |14.000    2.33 | 20.00    0.58
                2.083    0.63 | 8.083    1.31 |14.083    1.55 | 20.08    0.82
                2.167    0.63 | 8.167    1.31 |14.167    1.55 | 20.17    0.82
                2.250    0.63 | 8.250    1.31 |14.250    1.55 | 20.25    0.82
                2.333    0.63 | 8.333    1.31 |14.333    1.55 | 20.33    0.82
                2.417    0.63 | 8.417    1.31 |14.417    1.55 | 20.42    0.82
                2.500    0.63 | 8.500    1.31 |14.500    1.55 | 20.50    0.82
                2.583    0.63 | 8.583    1.31 |14.583    1.55 | 20.58    0.82
                2.667    0.63 | 8.667    1.31 |14.667    1.55 | 20.67    0.82
                2.750    0.63 | 8.750    1.31 |14.750    1.55 | 20.75    0.82
                2.833    0.63 | 8.833    1.31 |14.833    1.55 | 20.83    0.82
                2.917    0.63 | 8.917    1.31 |14.917    1.55 | 20.92    0.82
                3.000    0.63 | 9.000    1.31 |15.000    1.55 | 21.00    0.82
                3.083    0.63 | 9.083    1.65 |15.083    1.36 | 21.08    0.53
                3.167    0.63 | 9.167    1.65 |15.167    1.36 | 21.17    0.53
                3.250    0.63 | 9.250    1.65 |15.250    1.36 | 21.25    0.53
                3.333    0.63 | 9.333    1.65 |15.333    1.36 | 21.33    0.53
                3.417    0.63 | 9.417    1.65 |15.417    1.36 | 21.42    0.53
                3.500    0.63 | 9.500    1.65 |15.500    1.36 | 21.50    0.53
                3.583    0.63 | 9.583    1.65 |15.583    1.36 | 21.58    0.53
                3.667    0.63 | 9.667    1.65 |15.667    1.36 | 21.67    0.53
                3.750    0.63 | 9.750    1.65 |15.750    1.36 | 21.75    0.53
                3.833    0.63 | 9.833    1.65 |15.833    1.36 | 21.83    0.53
                3.917    0.63 | 9.917    1.65 |15.917    1.36 | 21.92    0.53
                4.000    0.63 |10.000    1.65 |16.000    1.36 | 22.00    0.53
                4.083    0.82 |10.083    2.62 |16.083    1.07 | 22.08    0.48
                4.167    0.82 |10.167    2.62 |16.167    1.07 | 22.17    0.48
                4.250    0.82 |10.250    2.62 |16.250    1.07 | 22.25    0.48
                4.333    0.82 |10.333    2.62 |16.333    1.07 | 22.33    0.48
                4.417    0.82 |10.417    2.62 |16.417    1.07 | 22.42    0.48
                4.500    0.82 |10.500    2.62 |16.500    1.07 | 22.50    0.48
                4.583    0.82 |10.583    2.62 |16.583    1.07 | 22.58    0.48
                4.667    0.82 |10.667    2.62 |16.667    1.07 | 22.67    0.48
                4.750    0.82 |10.750    2.62 |16.750    1.07 | 22.75    0.48
                4.833    0.82 |10.833    2.62 |16.833    1.07 | 22.83    0.48
                4.917    0.82 |10.917    2.62 |16.917    1.07 | 22.92    0.48
                5.000    0.82 |11.000    2.62 |17.000    1.07 | 23.00    0.48
                5.083    0.73 |11.083   20.75 |17.083    1.11 | 23.08    0.48
                5.167    0.73 |11.167   20.75 |17.167    1.11 | 23.17    0.48
                5.250    0.73 |11.250   20.75 |17.250    1.11 | 23.25    0.48
                5.333    0.73 |11.333   20.75 |17.333    1.11 | 23.33    0.48
                5.417    0.73 |11.417   20.75 |17.417    1.11 | 23.42    0.48
                5.500    0.73 |11.500   20.75 |17.500    1.11 | 23.50    0.48
                5.583    0.73 |11.583   20.75 |17.583    1.11 | 23.58    0.48
                5.667    0.73 |11.667   20.75 |17.667    1.11 | 23.67    0.48
                5.750    0.73 |11.750   20.75 |17.750    1.11 | 23.75    0.48
                5.833    0.73 |11.833   20.75 |17.833    1.11 | 23.83    0.48
                5.917    0.73 |11.917   20.75 |17.917    1.11 | 23.92    0.48
                6.000    0.73 |12.000   20.75 |18.000    1.11 | 24.00    0.48

     Max.Eff.Inten.(mm/hr)=       20.75         14.81
                over (min)        5.00          30.00
     Storage Coeff.  (min)=        2.19 (ii)    25.16 (ii)
     Unit Hyd. Tpeak (min)=        5.00         30.00
```

```
     Unit Hyd. peak  (cms)=       0.31         0.04
                                                          *TOTALS*
     PEAK FLOW      (cms)=       0.00         0.00          0.004 (iii)
     TIME TO PEAK    (hrs)=      11.42        12.25          12.00
     RUNOFF VOLUME    (mm)=      46.90         5.09          26.45
     TOTAL RAINFALL   (mm)=      48.47        48.47          48.47
     RUNOFF COEFFICIENT   =       0.97         0.10           0.55

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.32
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      54.77        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      20.75         0.00
                over (min)        5.00       300.00
     Storage Coeff.  (min)=       3.34 (ii)  296.66 (ii)
     Unit Hyd. Tpeak (min)=       5.00       300.00
     Unit Hyd. peak  (cms)=       0.26         0.00
                                                          *TOTALS*
     PEAK FLOW      (cms)=       0.01         0.00          0.006 (iii)
     TIME TO PEAK    (hrs)=      11.67         0.00          12.00
     RUNOFF VOLUME    (mm)=      46.90         0.00          11.72
     TOTAL RAINFALL   (mm)=      48.47        48.47          48.47
     RUNOFF COEFFICIENT   =       0.97         0.00           0.24

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89         0.51
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     150.55        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      20.75        30.97
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       6.13 (ii)   23.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.19         0.05
```



```
                                                          *TOTALS*
     PEAK FLOW      (cms)=       0.13         0.04          0.168 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.08          12.00
     RUNOFF VOLUME    (mm)=      46.90        12.05          35.75
     TOTAL RAINFALL   (mm)=      48.47        48.47          48.47
     RUNOFF COEFFICIENT   =       0.97         0.25           0.74


       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.69
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      85.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      20.75         0.31
                over (min)        5.00       115.00
     Storage Coeff.  (min)=       4.37 (ii)  111.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00       115.00
     Unit Hyd. peak  (cms)=       0.23         0.01
                                                          *TOTALS*
     PEAK FLOW      (cms)=       0.02         0.00          0.019 (iii)
     TIME TO PEAK    (hrs)=      11.92        13.83          12.00
     RUNOFF VOLUME    (mm)=      46.90         0.28          14.27
     TOTAL RAINFALL   (mm)=      48.47        48.47          48.47
     RUNOFF COEFFICIENT   =       0.97         0.01           0.29

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.11   0.004    12.00    26.45
        + ID2= 2 (0002):     0.45   0.006    12.00    11.72
          ==============================================
          ID = 3 (0006):     0.56   0.010    12.00    14.62

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):     0.56   0.010    12.00    14.62
        + ID2= 2 (0003):     3.40   0.168    12.00    35.75
```

```
          ================================================
          ID = 1 (0006):     3.96   0.179    12.00    32.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     3.96   0.179    12.00    32.76
        + ID2= 2 (0004):     1.10   0.019    12.00    14.27
          ================================================
          ID = 3 (0006):     5.06   0.198    12.00    28.74

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         0.12
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      95.22        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      20.75        49.05
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.65 (ii)   18.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.22         0.06
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.02          0.072 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.00          12.00
     RUNOFF VOLUME    (mm)=      46.90        15.66          38.46
     TOTAL RAINFALL   (mm)=      48.47        48.47          48.47
     RUNOFF COEFFICIENT   =       0.97         0.32           0.79

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96         0.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     152.32        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      20.75        30.97
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       6.17 (ii)   23.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.19         0.05
```



```
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.04          0.172 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.08          12.00
     RUNOFF VOLUME    (mm)=      46.90        12.05          35.75
     TOTAL RAINFALL   (mm)=      48.47        48.47          48.47
     RUNOFF COEFFICIENT   =       0.97         0.25           0.74

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):     1.36   0.072    12.00    38.46
        + ID2= 2 (0009):     3.48   0.172    12.00    35.75
          ================================================
          ID = 3 (0013):     4.84   0.245    12.00    36.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.3000      0.1050
                          0.0070     0.0074   |   0.5300      0.1375
                          0.0074     0.0810   |   1.8000      0.2179
                          0.2000     0.1000   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0013)      4.840      0.245     12.00      36.51
     OUTFLOW: ID= 1 (0012)      4.840      0.110     12.25      36.46

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 44.90
                    TIME SHIFT OF PEAK FLOW        (min)= 15.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0912

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.13
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      34.64        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      20.75         0.00
                over (min)        5.00       300.00
     Storage Coeff.  (min)=       2.54 (ii)  295.86 (ii)
     Unit Hyd. Tpeak (min)=       5.00       300.00
     Unit Hyd. peak  (cms)=       0.29         0.00
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.003 (iii)
     TIME TO PEAK    (hrs)=      11.50         0.00          12.00
     RUNOFF VOLUME    (mm)=      46.90         0.00          12.71
```

```
     TOTAL RAINFALL   (mm)=      48.47        48.47          48.47
     RUNOFF COEFFICIENT   =       0.97         0.00           0.26

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03          0.01
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      16.33         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      20.75          0.00
                over (min)        5.00        295.00
     Storage Coeff.  (min)=       1.62 (ii)  294.94 (ii)
     Unit Hyd. Tpeak (min)=       5.00        295.00
     Unit Hyd. peak  (cms)=       0.32          0.00
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.00          0.002 (iii)
     TIME TO PEAK    (hrs)=      11.33          0.00          12.00
     RUNOFF VOLUME    (mm)=      46.90          0.00          32.05
     TOTAL RAINFALL   (mm)=      48.47         48.47          48.47
     RUNOFF COEFFICIENT   =       0.97          0.00           0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0011):     0.04   0.002    12.00    32.05
        + ID2= 2 (0012):     4.84   0.110    12.25    36.46
          ==================================================
          ID = 3 (0010):     4.88   0.110    12.25    36.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0010):     4.88   0.110    12.25    36.42
        + ID2= 2 (0008):     0.18   0.003    12.00    12.71
          ==================================================
```



```
          ID = 1 (0010):     5.06   0.111    12.25    35.58

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:  11 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\05dd4245
| Ptotal= 64.11 mm |    Comments: City of Ottawa: 5yr-24hr SCS (60 minute
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 1.00    0.96 |  7.00    1.28 | 13.00    6.99 | 19.00    0.96
                 2.00    0.45 |  8.00    1.28 | 14.00    3.08 | 20.00    0.77
                 3.00    0.83 |  9.00    1.73 | 15.00    2.05 | 21.00    1.09
                 4.00    0.83 | 10.00    2.18 | 16.00    1.80 | 22.00    0.71
                 5.00    1.09 | 11.00    3.46 | 17.00    1.41 | 23.00    0.64
                 6.00    0.96 | 12.00   27.45 | 18.00    1.47 | 24.00    0.64

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

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.07          0.04
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      27.08         40.00
     Mannings n           =      0.013         0.250

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


                              ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    0.96 | 6.083    1.28 |12.083    6.99 | 18.08    0.96
                0.167    0.96 | 6.167    1.28 |12.167    6.99 | 18.17    0.96
                0.250    0.96 | 6.250    1.28 |12.250    6.99 | 18.25    0.96
                0.333    0.96 | 6.333    1.28 |12.333    6.99 | 18.33    0.96
                0.417    0.96 | 6.417    1.28 |12.417    6.99 | 18.42    0.96
                0.500    0.96 | 6.500    1.28 |12.500    6.99 | 18.50    0.96
                0.583    0.96 | 6.583    1.28 |12.583    6.99 | 18.58    0.96
                0.667    0.96 | 6.667    1.28 |12.667    6.99 | 18.67    0.96
                0.750    0.96 | 6.750    1.28 |12.750    6.99 | 18.75    0.96
                0.833    0.96 | 6.833    1.28 |12.833    6.99 | 18.83    0.96
                0.917    0.96 | 6.917    1.28 |12.917    6.99 | 18.92    0.96
                1.000    0.96 | 7.000    1.28 |13.000    6.99 | 19.00    0.96
                1.083    0.45 | 7.083    1.28 |13.083    3.08 | 19.08    0.77
                1.167    0.45 | 7.167    1.28 |13.167    3.08 | 19.17    0.77
                1.250    0.45 | 7.250    1.28 |13.250    3.08 | 19.25    0.77
                1.333    0.45 | 7.333    1.28 |13.333    3.08 | 19.33    0.77
                1.417    0.45 | 7.417    1.28 |13.417    3.08 | 19.42    0.77
                1.500    0.45 | 7.500    1.28 |13.500    3.08 | 19.50    0.77
                1.583    0.45 | 7.583    1.28 |13.583    3.08 | 19.58    0.77
                1.667    0.45 | 7.667    1.28 |13.667    3.08 | 19.67    0.77
                1.750    0.45 | 7.750    1.28 |13.750    3.08 | 19.75    0.77
                1.833    0.45 | 7.833    1.28 |13.833    3.08 | 19.83    0.77
                1.917    0.45 | 7.917    1.28 |13.917    3.08 | 19.92    0.77
                2.000    0.45 | 8.000    1.28 |14.000    3.08 | 20.00    0.77
                2.083    0.83 | 8.083    1.73 |14.083    2.05 | 20.08    1.09
```

```
              2.167    0.83 | 8.167    1.73 |14.167    2.05 | 20.17    1.09
              2.250    0.83 | 8.250    1.73 |14.250    2.05 | 20.25    1.09
              2.333    0.83 | 8.333    1.73 |14.333    2.05 | 20.33    1.09
              2.417    0.83 | 8.417    1.73 |14.417    2.05 | 20.42    1.09
              2.500    0.83 | 8.500    1.73 |14.500    2.05 | 20.50    1.09
              2.583    0.83 | 8.583    1.73 |14.583    2.05 | 20.58    1.09
              2.667    0.83 | 8.667    1.73 |14.667    2.05 | 20.67    1.09
              2.750    0.83 | 8.750    1.73 |14.750    2.05 | 20.75    1.09
              2.833    0.83 | 8.833    1.73 |14.833    2.05 | 20.83    1.09
              2.917    0.83 | 8.917    1.73 |14.917    2.05 | 20.92    1.09
              3.000    0.83 | 9.000    1.73 |15.000    2.05 | 21.00    1.09
              3.083    0.83 | 9.083    2.18 |15.083    1.80 | 21.08    0.71
              3.167    0.83 | 9.167    2.18 |15.167    1.80 | 21.17    0.71
              3.250    0.83 | 9.250    2.18 |15.250    1.80 | 21.25    0.71
              3.333    0.83 | 9.333    2.18 |15.333    1.80 | 21.33    0.71
              3.417    0.83 | 9.417    2.18 |15.417    1.80 | 21.42    0.71
              3.500    0.83 | 9.500    2.18 |15.500    1.80 | 21.50    0.71
              3.583    0.83 | 9.583    2.18 |15.583    1.80 | 21.58    0.71
              3.667    0.83 | 9.667    2.18 |15.667    1.80 | 21.67    0.71
              3.750    0.83 | 9.750    2.18 |15.750    1.80 | 21.75    0.71
              3.833    0.83 | 9.833    2.18 |15.833    1.80 | 21.83    0.71
              3.917    0.83 | 9.917    2.18 |15.917    1.80 | 21.92    0.71
              4.000    0.83 |10.000    2.18 |16.000    1.80 | 22.00    0.71
              4.083    1.09 |10.083    3.46 |16.083    1.41 | 22.08    0.64
              4.167    1.09 |10.167    3.46 |16.167    1.41 | 22.17    0.64
              4.250    1.09 |10.250    3.46 |16.250    1.41 | 22.25    0.64
              4.333    1.09 |10.333    3.46 |16.333    1.41 | 22.33    0.64
              4.417    1.09 |10.417    3.46 |16.417    1.41 | 22.42    0.64
              4.500    1.09 |10.500    3.46 |16.500    1.41 | 22.50    0.64
              4.583    1.09 |10.583    3.46 |16.583    1.41 | 22.58    0.64
              4.667    1.09 |10.667    3.46 |16.667    1.41 | 22.67    0.64
              4.750    1.09 |10.750    3.46 |16.750    1.41 | 22.75    0.64
              4.833    1.09 |10.833    3.46 |16.833    1.41 | 22.83    0.64
              4.917    1.09 |10.917    3.46 |16.917    1.41 | 22.92    0.64
              5.000    1.09 |11.000    3.46 |17.000    1.41 | 23.00    0.64
              5.083    0.96 |11.083   27.45 |17.083    1.47 | 23.08    0.64
              5.167    0.96 |11.167   27.45 |17.167    1.47 | 23.17    0.64
              5.250    0.96 |11.250   27.45 |17.250    1.47 | 23.25    0.64
              5.333    0.96 |11.333   27.45 |17.333    1.47 | 23.33    0.64
              5.417    0.96 |11.417   27.45 |17.417    1.47 | 23.42    0.64
              5.500    0.96 |11.500   27.45 |17.500    1.47 | 23.50    0.64
              5.583    0.96 |11.583   27.45 |17.583    1.47 | 23.58    0.64
              5.667    0.96 |11.667   27.45 |17.667    1.47 | 23.67    0.64
              5.750    0.96 |11.750   27.45 |17.750    1.47 | 23.75    0.64
              5.833    0.96 |11.833   27.45 |17.833    1.47 | 23.83    0.64
              5.917    0.96 |11.917   27.45 |17.917    1.47 | 23.92    0.64
              6.000    0.96 |12.000   27.45 |18.000    1.47 | 24.00    0.64

     Max.Eff.Inten.(mm/hr)=      27.45        24.52
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       1.96 (ii)   20.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.31         0.05
                                                         *TOTALS*
     PEAK FLOW      (cms)=        0.00         0.00        0.006 (iii)
     TIME TO PEAK   (hrs)=       11.42        12.08        12.00
     RUNOFF VOLUME   (mm)=       62.54        13.38        39.43
     TOTAL RAINFALL  (mm)=       64.11        64.11        64.11
     RUNOFF COEFFICIENT  =        0.98         0.21         0.62

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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



```
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.32
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      54.77        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      27.45        14.71
                over (min)        5.00        30.00
     Storage Coeff.  (min)=       2.99 (ii)   26.01 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.28         0.04
                                                         *TOTALS*
     PEAK FLOW      (cms)=        0.01         0.01        0.014 (iii)
     TIME TO PEAK   (hrs)=       11.58        12.25        12.00
     RUNOFF VOLUME   (mm)=       62.54         6.62        20.60
     TOTAL RAINFALL  (mm)=       64.11        64.11        64.11
     RUNOFF COEFFICIENT  =        0.98         0.10         0.32

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89         0.51
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     150.55        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      27.45        45.35
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       5.48 (ii)   20.15 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.20         0.05
                                                         *TOTALS*
     PEAK FLOW      (cms)=        0.18         0.06        0.232 (iii)
     TIME TO PEAK   (hrs)=       12.00        12.00        12.00
     RUNOFF VOLUME   (mm)=       62.54        19.84        48.88
     TOTAL RAINFALL  (mm)=       64.11        64.11        64.11
     RUNOFF COEFFICIENT  =        0.98         0.31         0.76


       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   1.10
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.69
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      85.63        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      27.45        16.71
                over (min)        5.00        30.00
     Storage Coeff.  (min)=       3.90 (ii)   25.79 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.25         0.04
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.02          0.041 (iii)
     TIME TO PEAK    (hrs)=      11.83        12.25          12.00
     RUNOFF VOLUME    (mm)=      62.54         8.41          24.65
     TOTAL RAINFALL   (mm)=      64.11        64.11          64.11
     RUNOFF COEFFICIENT   =       0.98         0.13           0.38

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.11   0.006    12.00    39.43
        + ID2= 2 (0002):     0.45   0.014    12.00    20.60
          ===============================================
          ID = 3 (0006):     0.56   0.020    12.00    24.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):     0.56   0.020    12.00    24.30
        + ID2= 2 (0003):     3.40   0.232    12.00    48.88
          ===============================================
          ID = 1 (0006):     3.96   0.252    12.00    45.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     3.96   0.252    12.00    45.40
        + ID2= 2 (0004):     1.10   0.041    12.00    24.65
          ===============================================
          ID = 3 (0006):     5.06   0.293    12.00    40.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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



```
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         0.12
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      95.22        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      27.45        69.15
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.16 (ii)   16.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.24         0.06
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.02          0.098 (iii)
     TIME TO PEAK    (hrs)=      11.92        12.00          12.00
     RUNOFF VOLUME    (mm)=      62.54        24.08          52.16
     TOTAL RAINFALL   (mm)=      64.11        64.11          64.11
     RUNOFF COEFFICIENT   =       0.98         0.38           0.81

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96         0.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     152.32        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      27.45        45.35
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       5.52 (ii)   20.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.20         0.05
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.06          0.238 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.00          12.00
     RUNOFF VOLUME    (mm)=      62.54        19.84          48.88
     TOTAL RAINFALL   (mm)=      64.11        64.11          64.11
     RUNOFF COEFFICIENT   =       0.98         0.31           0.76


       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
```

```
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):      1.36   0.098    12.00    52.16
        + ID2= 2 (0009):      3.48   0.238    12.00    48.88
          ===============================================
          ID = 3 (0013):      4.84   0.335    12.00    49.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           0.0000     0.0000   |   0.3000      0.1050
                           0.0070     0.0074   |   0.5300      0.1375
                           0.0074     0.0810   |   1.8000      0.2179
                           0.2000     0.1000   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0013)      4.840      0.335     12.00      49.80
     OUTFLOW: ID= 1 (0012)      4.840      0.274     12.08      49.74

                   PEAK   FLOW    REDUCTION [Qout/Qin](%)= 81.74
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1046

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05          0.13
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      34.64         40.00
     Mannings n          =       0.013         0.250

     Max.Eff.Inten.(mm/hr)=      27.45         13.04
                over (min)        5.00         30.00
     Storage Coeff.  (min)=       2.27 (ii)    26.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00         30.00
     Unit Hyd. peak  (cms)=       0.30          0.04
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.00         0.005 (iii)
     TIME TO PEAK    (hrs)=      11.50         12.25        12.00
     RUNOFF VOLUME    (mm)=      62.54          5.43        20.90
     TOTAL RAINFALL   (mm)=      64.11         64.11        64.11
     RUNOFF COEFFICIENT   =       0.98          0.08         0.33

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
```



```
     Surface Area     (ha)=       0.03          0.01
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=       1.00          0.50
     Length            (m)=      16.33         40.00
     Mannings n          =       0.013         0.250

     Max.Eff.Inten.(mm/hr)=      27.45         13.04
                over (min)        5.00         30.00
     Storage Coeff.  (min)=       1.44 (ii)    25.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00         30.00
     Unit Hyd. peak  (cms)=       0.33          0.04
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.00         0.002 (iii)
     TIME TO PEAK    (hrs)=      11.33         12.25        12.00
     RUNOFF VOLUME    (mm)=      62.54          5.43        46.22
     TOTAL RAINFALL   (mm)=      64.11         64.11        64.11
     RUNOFF COEFFICIENT   =       0.98          0.08         0.72

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0011):      0.04   0.002    12.00    46.22
        + ID2= 2 (0012):      4.84   0.274    12.08    49.74
          ===============================================
          ID = 3 (0010):      4.88   0.276    12.00    49.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0010):      4.88   0.276    12.00    49.71
        + ID2= 2 (0008):      0.18   0.005    12.00    20.90
          ===============================================
          ID = 1 (0010):      5.06   0.281    12.00    48.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:  12 **
  ****************************

--------------------
|   READ STORM     |    Filename: C:\Users\borendorff.NOVATECH\AppD
|                  |              ata\Local\Temp\
|                  |              828b6ea6-f7be-4f55-aa5c-00940feb087a\99161296
| Ptotal=106.73 mm |    Comments: City of Ottawa: 100yr-24hr SCS (60 minut
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 1.00    1.60 |  7.00    2.13 | 13.00   11.63 | 19.00    1.60
                 2.00    0.75 |  8.00    2.13 | 14.00    5.12 | 20.00    1.28
                 3.00    1.39 |  9.00    2.88 | 15.00    3.42 | 21.00    1.81
```

```
              4.00    1.39 | 10.00    3.63 | 16.00    2.99 | 22.00    1.17
              5.00    1.81 | 11.00    5.76 | 17.00    2.35 | 23.00    1.07
              6.00    1.60 | 12.00   45.69 | 18.00    2.46 | 24.00    1.07

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

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   0.11
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  53.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.07          0.04
     Dep. Storage     (mm)=      1.57          4.67
     Average Slope     (%)=      1.00          0.50
     Length            (m)=     27.08         40.00
     Mannings n          =      0.013         0.250

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


                               ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.60 | 6.083    2.13 |12.083   11.63 | 18.08    1.60
               0.167    1.60 | 6.167    2.13 |12.167   11.63 | 18.17    1.60
               0.250    1.60 | 6.250    2.13 |12.250   11.63 | 18.25    1.60
               0.333    1.60 | 6.333    2.13 |12.333   11.63 | 18.33    1.60
               0.417    1.60 | 6.417    2.13 |12.417   11.63 | 18.42    1.60
               0.500    1.60 | 6.500    2.13 |12.500   11.63 | 18.50    1.60
               0.583    1.60 | 6.583    2.13 |12.583   11.63 | 18.58    1.60
               0.667    1.60 | 6.667    2.13 |12.667   11.63 | 18.67    1.60
               0.750    1.60 | 6.750    2.13 |12.750   11.63 | 18.75    1.60
               0.833    1.60 | 6.833    2.13 |12.833   11.63 | 18.83    1.60
               0.917    1.60 | 6.917    2.13 |12.917   11.63 | 18.92    1.60
               1.000    1.60 | 7.000    2.13 |13.000   11.63 | 19.00    1.60
               1.083    0.75 | 7.083    2.13 |13.083    5.12 | 19.08    1.28
               1.167    0.75 | 7.167    2.13 |13.167    5.12 | 19.17    1.28
               1.250    0.75 | 7.250    2.13 |13.250    5.12 | 19.25    1.28
               1.333    0.75 | 7.333    2.13 |13.333    5.12 | 19.33    1.28
               1.417    0.75 | 7.417    2.13 |13.417    5.12 | 19.42    1.28
               1.500    0.75 | 7.500    2.13 |13.500    5.12 | 19.50    1.28
               1.583    0.75 | 7.583    2.13 |13.583    5.12 | 19.58    1.28
               1.667    0.75 | 7.667    2.13 |13.667    5.12 | 19.67    1.28
               1.750    0.75 | 7.750    2.13 |13.750    5.12 | 19.75    1.28
               1.833    0.75 | 7.833    2.13 |13.833    5.12 | 19.83    1.28
               1.917    0.75 | 7.917    2.13 |13.917    5.12 | 19.92    1.28
               2.000    0.75 | 8.000    2.13 |14.000    5.12 | 20.00    1.28
               2.083    1.39 | 8.083    2.88 |14.083    3.42 | 20.08    1.81
               2.167    1.39 | 8.167    2.88 |14.167    3.42 | 20.17    1.81
               2.250    1.39 | 8.250    2.88 |14.250    3.42 | 20.25    1.81
               2.333    1.39 | 8.333    2.88 |14.333    3.42 | 20.33    1.81
               2.417    1.39 | 8.417    2.88 |14.417    3.42 | 20.42    1.81
               2.500    1.39 | 8.500    2.88 |14.500    3.42 | 20.50    1.81
               2.583    1.39 | 8.583    2.88 |14.583    3.42 | 20.58    1.81
               2.667    1.39 | 8.667    2.88 |14.667    3.42 | 20.67    1.81
               2.750    1.39 | 8.750    2.88 |14.750    3.42 | 20.75    1.81
               2.833    1.39 | 8.833    2.88 |14.833    3.42 | 20.83    1.81
               2.917    1.39 | 8.917    2.88 |14.917    3.42 | 20.92    1.81
               3.000    1.39 | 9.000    2.88 |15.000    3.42 | 21.00    1.81
               3.083    1.39 | 9.083    3.63 |15.083    2.99 | 21.08    1.17
               3.167    1.39 | 9.167    3.63 |15.167    2.99 | 21.17    1.17
               3.250    1.39 | 9.250    3.63 |15.250    2.99 | 21.25    1.17
               3.333    1.39 | 9.333    3.63 |15.333    2.99 | 21.33    1.17
               3.417    1.39 | 9.417    3.63 |15.417    2.99 | 21.42    1.17
               3.500    1.39 | 9.500    3.63 |15.500    2.99 | 21.50    1.17
               3.583    1.39 | 9.583    3.63 |15.583    2.99 | 21.58    1.17
               3.667    1.39 | 9.667    3.63 |15.667    2.99 | 21.67    1.17
               3.750    1.39 | 9.750    3.63 |15.750    2.99 | 21.75    1.17
               3.833    1.39 | 9.833    3.63 |15.833    2.99 | 21.83    1.17
```



```
               3.917    1.39 | 9.917    3.63 |15.917    2.99 | 21.92    1.17
               4.000    1.39 |10.000    3.63 |16.000    2.99 | 22.00    1.17
               4.083    1.81 |10.083    5.76 |16.083    2.35 | 22.08    1.07
               4.167    1.81 |10.167    5.76 |16.167    2.35 | 22.17    1.07
               4.250    1.81 |10.250    5.76 |16.250    2.35 | 22.25    1.07
               4.333    1.81 |10.333    5.76 |16.333    2.35 | 22.33    1.07
               4.417    1.81 |10.417    5.76 |16.417    2.35 | 22.42    1.07
               4.500    1.81 |10.500    5.76 |16.500    2.35 | 22.50    1.07
               4.583    1.81 |10.583    5.76 |16.583    2.35 | 22.58    1.07
               4.667    1.81 |10.667    5.76 |16.667    2.35 | 22.67    1.07
               4.750    1.81 |10.750    5.76 |16.750    2.35 | 22.75    1.07
               4.833    1.81 |10.833    5.76 |16.833    2.35 | 22.83    1.07
               4.917    1.81 |10.917    5.76 |16.917    2.35 | 22.92    1.07
               5.000    1.81 |11.000    5.76 |17.000    2.35 | 23.00    1.07
               5.083    1.60 |11.083   45.69 |17.083    2.46 | 23.08    1.07
               5.167    1.60 |11.167   45.69 |17.167    2.46 | 23.17    1.07
               5.250    1.60 |11.250   45.69 |17.250    2.46 | 23.25    1.07
               5.333    1.60 |11.333   45.69 |17.333    2.46 | 23.33    1.07
               5.417    1.60 |11.417   45.69 |17.417    2.46 | 23.42    1.07
               5.500    1.60 |11.500   45.69 |17.500    2.46 | 23.50    1.07
               5.583    1.60 |11.583   45.69 |17.583    2.46 | 23.58    1.07
               5.667    1.60 |11.667   45.69 |17.667    2.46 | 23.67    1.07
               5.750    1.60 |11.750   45.69 |17.750    2.46 | 23.75    1.07
               5.833    1.60 |11.833   45.69 |17.833    2.46 | 23.83    1.07
               5.917    1.60 |11.917   45.69 |17.917    2.46 | 23.92    1.07
               6.000    1.60 |12.000   45.69 |18.000    2.46 | 24.00    1.07

     Max.Eff.Inten.(mm/hr)=      45.69        49.96
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.60 (ii)   15.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.33         0.07
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.012 (iii)
     TIME TO PEAK    (hrs)=      11.42        12.00          12.00
     RUNOFF VOLUME    (mm)=     105.16        34.82          72.10
     TOTAL RAINFALL   (mm)=     106.73       106.73         106.73
     RUNOFF COEFFICIENT   =       0.99         0.33           0.68

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  25.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.13          0.32
     Dep. Storage     (mm)=      1.57          4.67
     Average Slope     (%)=      1.00          0.50
     Length            (m)=     54.77         40.00
     Mannings n          =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      45.69        34.33
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       2.44 (ii)   18.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.30         0.06
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.03          0.042 (iii)
     TIME TO PEAK    (hrs)=      11.58        12.00          12.00
     RUNOFF VOLUME    (mm)=     105.16        28.12          47.38
```

```
     TOTAL RAINFALL   (mm)=     106.73       106.73        106.73
     RUNOFF COEFFICIENT   =       0.99         0.26          0.44

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0003) |   Area    (ha)=   3.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.89         0.51
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     150.55        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      45.69        84.27
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.47 (ii)   15.92 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.23         0.07
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.29         0.11          0.407 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.00         12.00
     RUNOFF VOLUME    (mm)=     105.16        42.76         85.19
     TOTAL RAINFALL   (mm)=     106.73       106.73        106.73
     RUNOFF COEFFICIENT   =       0.99         0.40          0.80

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0004) |   Area    (ha)=   1.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.69
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      85.63        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      45.69        37.53
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       3.18 (ii)   19.02 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.27         0.06
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.06          0.106 (iii)
     TIME TO PEAK    (hrs)=      11.75        12.00         12.00
     RUNOFF VOLUME    (mm)=     105.16        29.37         52.11
     TOTAL RAINFALL   (mm)=     106.73       106.73        106.73
     RUNOFF COEFFICIENT   =       0.99         0.28          0.49
```



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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.11   0.012    12.00    72.10
        + ID2= 2 (0002):     0.45   0.042    12.00    47.38
          ===============================================
          ID = 3 (0006):     0.56   0.054    12.00    52.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0006):     0.56   0.054    12.00    52.23
        + ID2= 2 (0003):     3.40   0.407    12.00    85.19
          ===============================================
          ID = 1 (0006):     3.96   0.461    12.00    80.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     3.96   0.461    12.00    80.53
        + ID2= 2 (0004):     1.10   0.106    12.00    52.11
          ===============================================
          ID = 3 (0006):     5.06   0.567    12.00    74.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0007) |   Area    (ha)=   1.36
|ID= 1 DT= 5.0 min |   Total Imp(%)=  91.00   Dir. Conn.(%)=  73.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         0.12
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      95.22        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      45.69       123.87
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.39 (ii)   13.21 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.26         0.08
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.04          0.167 (iii)
     TIME TO PEAK    (hrs)=      11.83        12.00         12.00
```

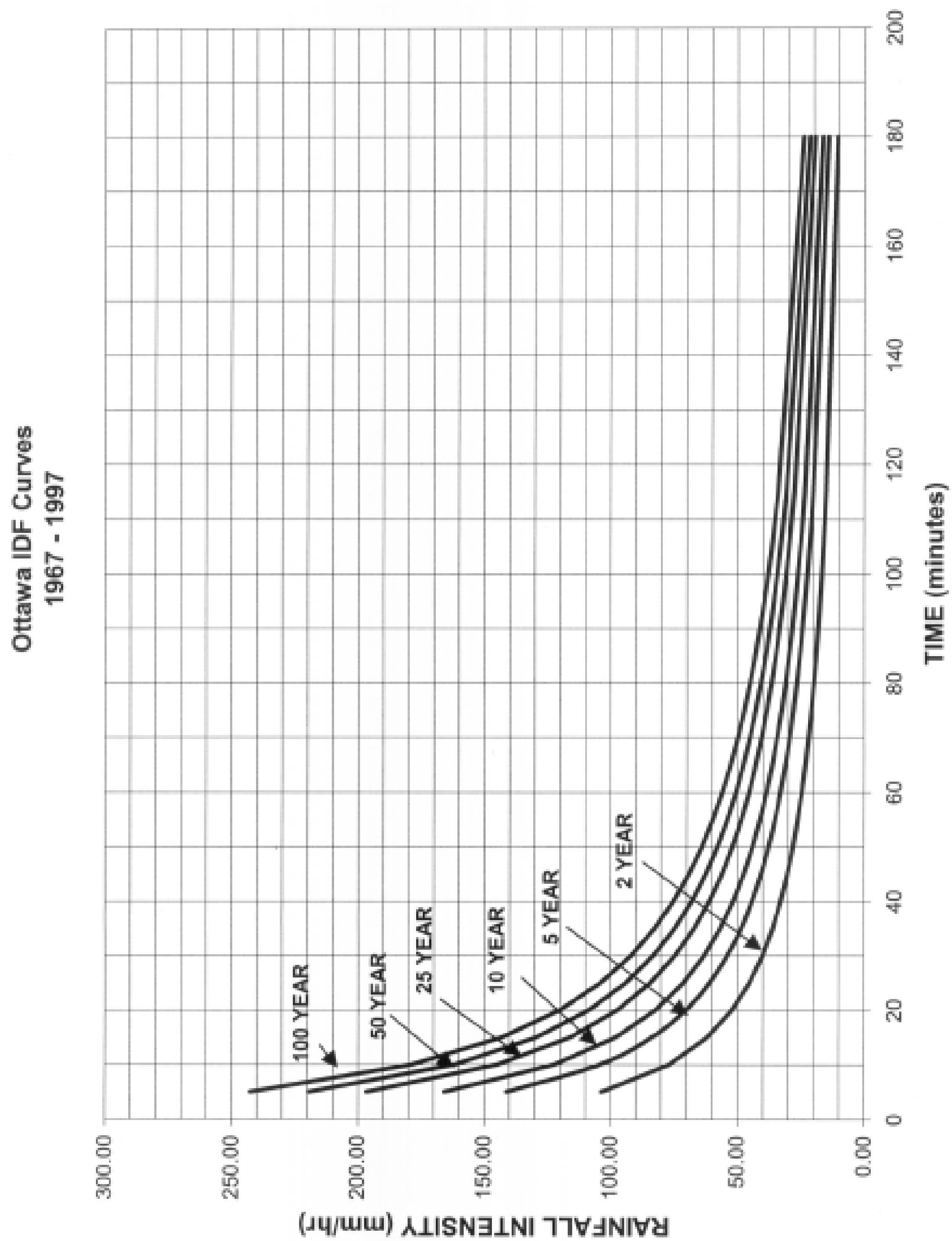
```
     RUNOFF VOLUME    (mm)=     105.16        49.04          90.01
     TOTAL RAINFALL   (mm)=     106.73       106.73         106.73
     RUNOFF COEFFICIENT   =       0.99         0.46           0.84

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0009) |   Area    (ha)=   3.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  68.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.96         0.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=     152.32        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      45.69        84.27
                over (min)       5.00        20.00
     Storage Coeff.  (min)=       4.50 (ii)   15.95 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.23         0.07
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.30         0.12          0.416 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.00          12.00
     RUNOFF VOLUME    (mm)=     105.16        42.76          85.19
     TOTAL RAINFALL   (mm)=     106.73       106.73         106.73
     RUNOFF COEFFICIENT   =       0.99         0.40           0.80

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0007):     1.36    0.167    12.00    90.01
        + ID2= 2 (0009):     3.48    0.416    12.00    85.19
          ===============================================
          ID = 3 (0013):     4.84    0.583    12.00    86.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000      0.0000   |   0.3000      0.1050
                         0.0070      0.0074   |   0.5300      0.1375
                         0.0074      0.0810   |   1.8000      0.2179
                         0.2000      0.1000   |   0.0000      0.0000
```



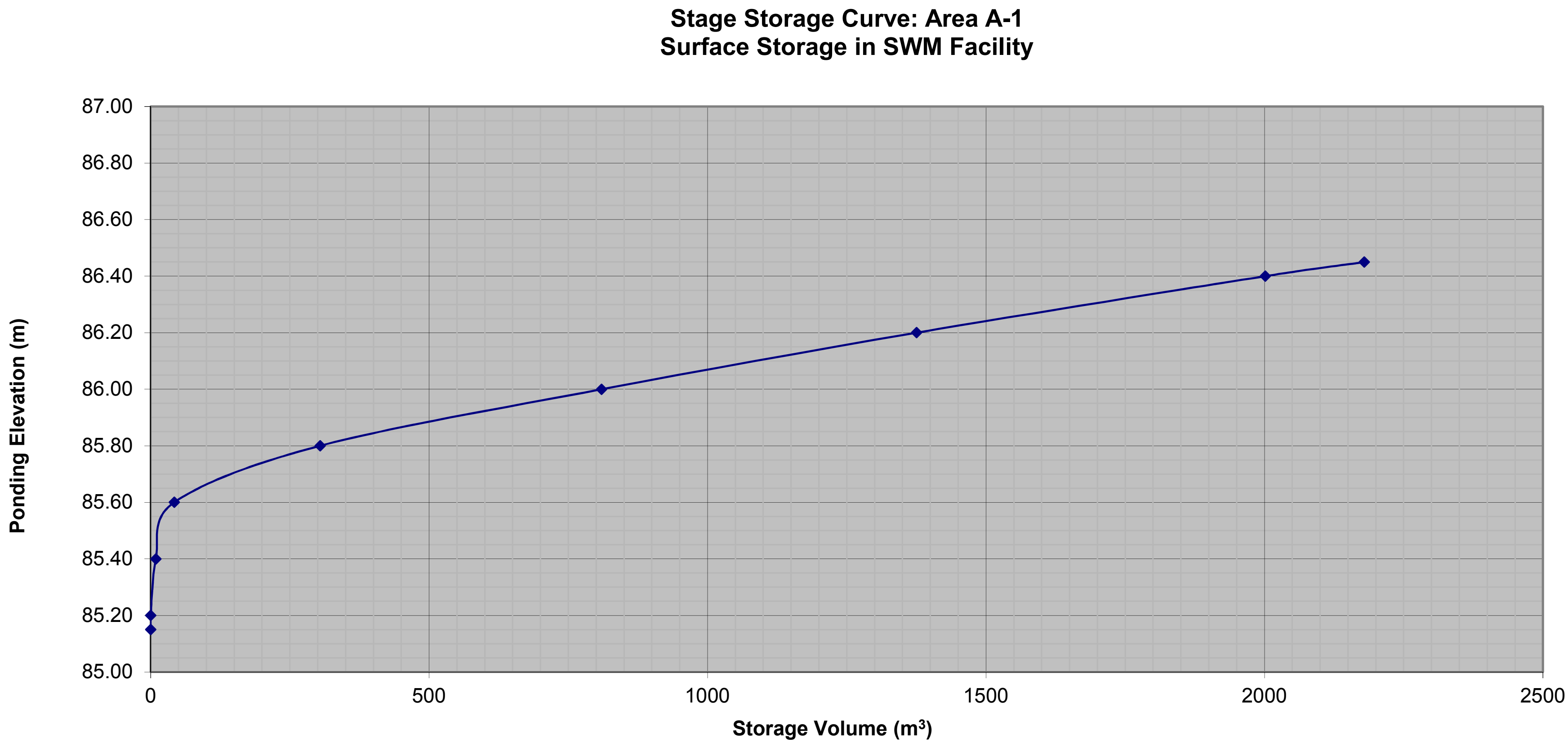
```
                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0013)     4.840     0.583     12.00      86.54
     OUTFLOW: ID= 1 (0012)     4.840     0.508     12.00      86.49

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 87.05
                   TIME SHIFT OF PEAK FLOW        (min)=  0.00
                   MAXIMUM  STORAGE   USED      (ha.m.)=  0.1355

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0008) |   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  28.00   Dir. Conn.(%)=  28.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.13
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      34.64        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      45.69        32.41
                over (min)       5.00        20.00
     Storage Coeff.  (min)=       1.85 (ii)   18.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.32         0.06
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.017 (iii)
     TIME TO PEAK    (hrs)=      11.42        12.00          12.00
     RUNOFF VOLUME    (mm)=     105.16        27.25          49.06
     TOTAL RAINFALL   (mm)=     106.73       106.73         106.73
     RUNOFF COEFFICIENT   =       0.99         0.26           0.46

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0011) |   Area    (ha)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  78.00   Dir. Conn.(%)=  78.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.01
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      16.33        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      45.69        32.41
                over (min)       5.00        20.00
     Storage Coeff.  (min)=       1.18 (ii)   17.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.33         0.06
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.005 (iii)
     TIME TO PEAK    (hrs)=      11.33        12.00          12.00
     RUNOFF VOLUME    (mm)=     105.16        27.25          86.35
     TOTAL RAINFALL   (mm)=     106.73       106.73         106.73
     RUNOFF COEFFICIENT   =       0.99         0.26           0.81

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

```
      (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0011):     0.04   0.005    12.00    86.35
        + ID2= 2 (0012):     4.84   0.508    12.00    86.49
          ====================================================
          ID = 3 (0010):     4.88   0.513    12.00    86.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0010) |
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0010):     4.88   0.513    12.00    86.49
        + ID2= 2 (0008):     0.18   0.017    12.00    49.06
          ====================================================
          ID = 1 (0010):     5.06   0.529    12.00    85.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

 FINISH
=============================================================================================
===============
```

APPENDIX 5-A OTTAWA INTENSITY DURATION FREQUENCY (IDF) CURVE



Surface Storage Table for Area A-1		
Elevation	Surface Area	Cumulative Volume
m	m^2	m^3
85.15	0	0
85.20	7.2	0.2
85.40	85.4	9.4
85.60	243.7	42.3
85.80	2374.7	304.2
86.00	2681.2	809.8
86.20	2975.4	1375.4
86.40	3285.6	2001.5
86.45	3828.4	2179.4



Broad Crested Weir

Q (m^3/s) = C x L x $H^{(3/2)}$

Weir Coefficeint	1.84
Bottom Width (m)	3.2
Bottom of Weir Elevation (m)	86.00

Water Level Elevation	**Flow Rate Over Weir**	
(m)	**(m^3/s)**	**(L/s)**
86.00	0.000	0.0
86.05	0.066	65.8
86.10	0.186	186.2
86.15	0.342	342.1
86.20	0.527	526.6
86.25	0.736	736.0
86.30	0.967	967.5
86.35	1.219	1219.2
86.40	1.490	1489.6
86.45	1.777	1777.4

APPENDIX E

IPEX Inlet Control Device Information

IPEX Tempest™ Inlet Control Devices

Municipal Technical Manual Series

Vol. I, 2nd Edition

PRODUCT INFORMATION: TEMPEST LOW, MEDIUM FLOW (LMF) ICD

Purpose

To control the amount of storm water runoff entering a sewer system by allowing a specified flow volume out of a catch basin or manhole at a specified head. This approach conserves pipe capacity so that catch basins downstream do not become uncontrollably surcharged, which can lead to basement floods, flash floods and combined sewer overflows.

Product Description

Our LMF ICD is designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter and larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 14 preset flow curves, the LMF ICD has the ability to provide flow rates: 2lps – 17lps (31gpm – 270gpm)

Product Function

The LMF ICD vortex flow action allows the LMF ICD to provide a narrower flow curve using a larger orifice than a conventional orifice plate ICD, making it less likely to clog. When comparing flows at the same head level, the LMF ICD has the ability to restrict more flow than a conventional ICD during a rain event, preserving greater sewer capacity.

Product Construction

Constructed from durable PVC, the LMF ICD is light weight 8.9 Kg (19.7 lbs).

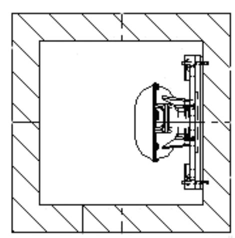
Product Applications

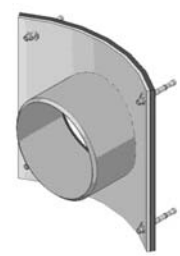
Will accommodate both square and round applications:

Square Application

Round Application

Universal Mounting Plate



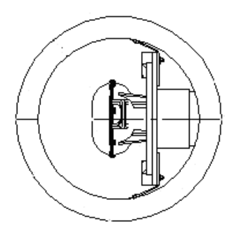


+

Spigot CB Wall Plate

=

Universal Mounting Plate Hub Adapter



TEMPEST LMF ICD

Chart 1: LMF 14 Preset Flow Curves

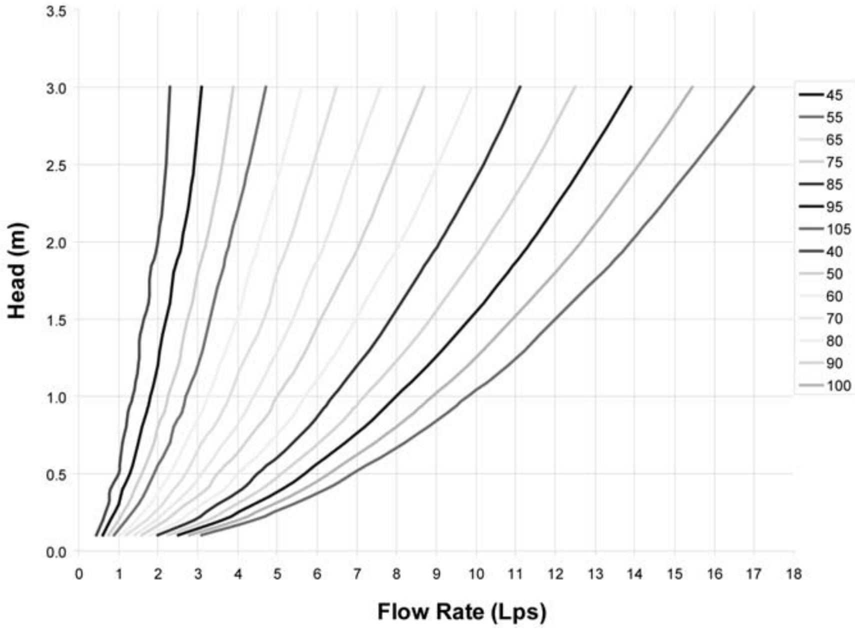
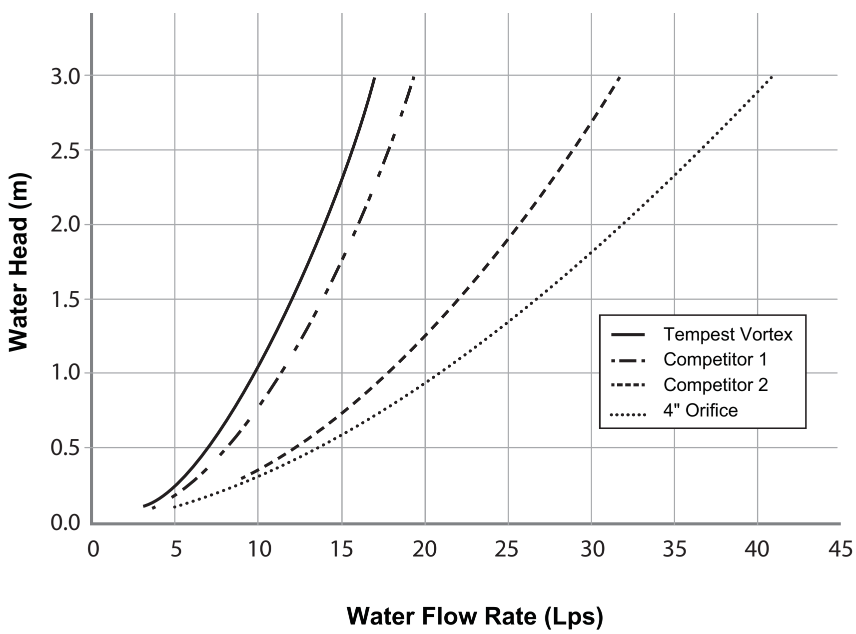


Chart 2: LMF Flow vs. ICD Alternatives



PRODUCT INSTALLATION

Instructions to assemble a TEMPEST LMF ICD into a Square Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device.
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST LMF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut back the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

APPENDIX F

CDS Oil-Grit Separator Information

Steve Matthews

From: George Gebara <george@echelonenvironmental.ca>
Sent: September-21-15 4:31 PM
To: Steve Matthews
Subject: RE: CDS Sizing Request - Ahlul Bayt Centre
Attachments: Ahlul Bayt Center, Ottawa (Novatech 09-2015).pdf

Steven,

Here you go.

Additional information :

Unit	Sump Volume (m^3)	Total Holding Volume (m^3)	Oil Capacity (L)
PMIU20_15_4i	1.016	1.773	232
PMSU20_15_4	1.016	1.773	232
PMSU20_15_5	1.668	2.826	313
PMSU20_15_5ES	2.039	3.197	313
PMSU20_15_6	2.402	4.050	414

The _4, _5 and _6 are for manhole sizes. For this unit a 4 foot (1200 mm) is sufficient
The es is for extended sump, again for thsi unit, a normal sump is sufficient
The "I" unit is a direct inlet unit (grated cover)

Standard industry warranty and site visits.

Budget prices are: _4 unit at 2 M is $15500 plus taxes and at 4 M is $16500 plus taxes.

ECHELON ENVIRONMENTAL
George Gebara, B. Eng.
Project Manager, Eastern Ontario
Echelon Environmental Inc.
cel: (613)298-5725
head office: (905)948-0000
fax: (905)948-0577
www.echelonenvironmental.ca

From: Steve Matthews [mailto:S.Matthews@novatech-eng.com]
Sent: September-21-15 3:45 PM

To: George Gebara
Subject: RE: CDS Sizing Request - Ahlul Bayt Centre

Hi George,

I just wanted to follow up on the OGS sizing for this project. We are not under a tight deadline right now, but I do anticipate that we will need to have something for submission to the City of Ottawa shortly. Can you please provide me with an update on the status of this request and let me know when we might receive the confirmation of sizing. If there is any further information that you need from me, please do not hesitate to call.

Thanks,
Steve

Stephen Matthews, Design / Drafting Technologist
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 223 | Fax: 613.254.5867

From: George Gebara [mailto:george@echelonenvironmental.ca]
Sent: August-27-15 3:30 PM
To: Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: CDS Sizing Request - Ahlul Bayt Centre

With apologies. I have not forgotten, we are working on it and will have a submittal for you soon.

As the flow will be limited to 7.4 l/sec into the OGS, our smallest unit will suffice. However, if the net flow (as a result of area and I) is large, sediment accumulation may be high. As such, we will verify if an extended sump is needed, or if the unit must be stepped up in manhole size.

Once again, my apologies and I will get back to you

Ahlul bayt…should be “ahl ul bayt”…”people/owners/family of the house” is the simple translation….this phrase has broad meaning and you can extend it to mean “heaven”…I am guessing a religious center. Interesting.

Georges

ECHELON ENVIRONMENTAL
George Gebara, B. Eng.
Project Manager, Eastern Ontario
Echelon Environmental Inc.
cel: (613)298-5725
head office: (905)948-0000
fax: (905)948-0577
www.echelonenvironmental.ca

From: Steve Matthews [mailto:S.Matthews@novatech-eng.com]
Sent: August-24-15 11:34 AM
To: George Gebara
Cc: Bryan Orendorff; Francois Thauvette
Subject: CDS Sizing Request - Ahlul Bayt Centre

Hi George,

We are currently working on another project in Ottawa that requires an oil/grit separator unit. The project is for the Ahlul Bayt Centre and is located in a developed industrial area at 3095 Albion Road in the City of Ottawa. The project details are as follows:

Total Tributary area = 4.84 ha (this area includes a site area of 1.37 ha [at 90% impervious] and an off-site tributary area of 3.47 ha [at 80% impervious] the off-site areas are simply being conveyed and do not require treatment)
Total Imperviousness = 83%
Time of concentration = 10min
IDF Curve = City of Ottawa (104.2mm/hr Intensity for 5yr) (178.6mm/hr Intensity for 100yr)

We have a requirement to provide a level of quality control treatment to meet the MOE 'Enhanced Protection' guidelines (i.e. 80% TSS removal and 90% of annual runoff treated) for the on-site areas only. The oil/grit separator will be installed on a new 300mm dia. PVC pipe with 90 degrees of separation through the structure and approximately 1.25m of cover on the pipes. A standard particle distribution (Fines) should be adequate for the design.

The peak design flow will be set at only 7.4 L/s based on the City's stringent requirements for the Sawmill Creek sub-watershed. As a result, there will be significant upstream attenuation in a linear SWM facility and a vortex type ICD within the parking lot storm structure immediately upstream of the OGS. This should significantly reduce the amount of suspended solids reaching the OGS. Flows for the 1:5yr event and larger will by-pass the OGS completely and be controlled and conveyed from the site via a concrete control weir directing flows to the off-site outlet ditch.

Surface Storage Table for Area A-1

Elevation	Surface Area	Cumulative Volume
m	m^2	m^3
85.15	0	0
85.20	7.2	0.2
85.40	85.4	9.4
85.60	243.7	42.3
85.80	2374.7	304.2
86.00	2681.2	809.8
86.20	2975.4	1375.4
86.40	3285.6	2001.5
86.45	3828.4	2179.4

OTTHTYMO Rating Curve

Release Rate (m^3/s)	Storage Volume (ha-m)
0.0000	0.00000
0.0070	0.00002
0.0074	0.00094
0.6000	0.00423
0.7700	0.03042
0.8000	0.08098
1.1100	0.13754
1.8000	0.20015
2.0000	0.21794

Can you please size a CDS unit for us and provide the design details as well as an approximate cost estimate. I have attached a preliminary sketches of the site showing the proposed location of the unit and the site grading with the linear SWM facility. Thank you for your time and consideration in this matter. If there is any further information you require, please do not hesitate to call.

Regards,
Steve

Stephen Matthews, Design / Drafting Technologist
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 223 | Fax: 613.254.5867

ECHELON ENVIRONMENTAL
505 Hood Road Unit 26 Markham ON L3R 5V6
Tel: (905) 948-0000 Fax: (905) 948-0577
E-mail: info@echelonenvironmental.ca

Sept.21, 2015

Mr. Stephen Matthews
Novatech Engineering Consultants Ltd
240 Michael Cowpland Drive, Suite 200
Ottawa, ON K2M 1P6

Subject: Submittal for CDS PMSU 20_15_4
Project: Ahlul Bayt Center,Ottawa ON.

Mr. Mathews,

Echelon Environmental is pleased to offer this detailed submittal package for approval of the CDS PMSU 20_15_4

Design Parameters

The proposed CDS PMSU unit was designed based on the following parameters sent to Echelon by Novatech Engineering Consultants Ltd.

Drainage Area:	1.37 ha
Imperviousness:	90%
Runoff Coefficient:	0.84 (Calculated)
Release rate	7.4 l/sec
Time of Concentration:	10 minutes (Assumed)
Target Particle Size Distribution:	Fine Distribution (see appendix I)
MOE Treatment Level:	TSS: 80%, Treated Volume: >90% (MOE LEVEL I)
Peak Flow to OGS:	TBD

TSS Removal Calculation

Our TSS removal calculation can be found in Appendix I. As indicated on the calculation, the CDS unit has been selected to capture 80% TSS on an average annual basis and treat 90% of the site runoff. As noted on the calculation, the TSS removal efficiency was based on a Fine PSD and Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON. . Appendix I also the validation against the chosen PSD.
Appendix II shows the anticipated grit load/cleaning cycle.

Cutsheet /Reference Drawing

PMSU 20_15_4 reference drawing is in Appendix III. Full Submittal drawing available upon request.

Structural Design

The proposed CDS PMSU unit has been is designed to Canadian Highway Bridge Design Code (CHBDC) loadings. All concrete components are manufactured at an OPS pre-qualified plant.

Approval Background

Currently over 2000 CDS units installed throughout Ontario with single units treating drainage areas ranging from 0.1 ha to 50 ha. The CDS Stormwater Treatment System is an approved product in Ontario and is servicing various jurisdictions throughout the province.

ECHELON ENVIRONMENTAL
505 Hood Road Unit 26 Markham ON L3R 5V6
Tel: (905) 948-0000 Fax: (905) 948-0577
E-mail: info@echelonenvironmental.ca

Approval of the CDS Technology for TSS Removal

NJDEP – CDS has met NJDEP's testing requirements and is a re-certified product as of January, 2015. It is also the only Oil/Grit Separator to have achieved Tier One and Tier Two testing with approved scour testing as of January, 2015.

Ministry of Environment - The Ministry of Environment (MOE) has reviewed the system and has provided Certificate of Approval/Environmental Compliance, (see Appendix IV). Approvals are for sites using CDS units to achieve Level 1 (80% TSS Removal, 90% Runoff Treated) treatment.

Ontario Provincial Standards – Ontario Provincial Standards' (OPS) Special Review Committee for the approval of oil/grit separators in municipal roadway applications, standardized a review process for all municipalities. CDS has been reviewed and approved by OPS. Certification is attached, Appendix IV.

System Features

Conventional oil-grit separators rely solely on gravity for grit separation. By contrast, CDS units utilize multiple hydraulic techniques to allow large flows to be processed in a compact footprint. These processes include gravity, swirl concentration and a patented inertial based screening process. In a CDS system, the energy in the storm flow is used to enhance separation, thereby allowing for a much more compact treatment chamber.

Floatables Containment

The CDS system removes 100% of the buoyant and neutrally buoyant material larger than 2.4mm up to the treatment flowrate. The system also incorporates a riser tube on top of the treatment chamber that extends beyond the high water condition to maintain the capture of buoyant material during peak events and temporary backwater conditions.

Hydrocarbon Capture

CDS units are capable of capturing and retaining hydrocarbons with its integral oil baffle design. CDS units were tested and demonstrated to be greater than 99% effective in controlling dry-weather accidental oil spills.

Internal High Flow By-Pass Capability

CDS units have an internal by-pass weir and are capable of by-passing peak design storm events. CDS units are custom designed for each site based on the specific hydraulic requirements.

Sump is Separate from the Treatment Chamber

CDS units have a separate treatment chamber and grit storage sump chamber. With this design feature, the geometry of the treatment chamber is not impacted by accumulated grit, and the independent sump chamber volume can be optimized to capture the estimated accumulated grit in between maintenance cycles.

Inspection and Maintenance

Echelon Environmental provides a full Operations and Maintenance Manual with as-built drawings included for all CDS units. Echelon Environmental also offers a comprehensive Inspection and Maintenance Program to assist owners in establishing long term maintenance for their separators.

We trust this submittal fully addresses all the tender requirements for the oil-grit separator.

Yours Truly,
Echelon Environmental Inc.
George Gebara, B.Eng - Project Manager

ECHELON
ENVIRONMENTAL

505 Hood Road Unit 26 Markham ON L3R 5V6
Tel: (905) 948-0000 Fax: (905) 948-0577
E-mail: info@echelonenvironmental.ca

APPENDIX I
CDS TSS REMOVAL CALCULATIONS
PSD VALIDATION

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name: Ahlul Bayt Centre
Location: Ottawa, ON
OGS #: OGS

Engineer: Novatech
Contact: Stephen Matthews
Report Date: 28-Aug-15

Area	1.37	ha
Weighted C	0.84	(assumed)
Orifice Control	7.4	L/s
CDS Model	2015	(select from pulldown)

Rainfall Station #	215	
(select from Rainfall Data column D)		
Particle Size Distribution	FINE	
CDS Treatment Capacity	20	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.2%	9.2%	1.6	1.6	8.1	96.5	8.8
1.0	10.6%	19.8%	3.2	3.2	16.1	94.2	10.0
1.5	9.9%	29.7%	4.8	4.8	24.2	91.9	9.1
2.0	8.4%	38.1%	6.4	6.4	32.3	89.6	7.5
2.5	7.7%	45.8%	7.4	7.4	37.3	88.2	6.8
3.0	5.9%	51.7%	7.4	7.4	37.3	88.2	5.2
3.5	4.4%	56.1%	7.4	7.4	37.3	88.2	3.8
4.0	4.7%	60.7%	7.4	7.4	37.3	88.2	4.1
4.5	3.3%	64.0%	7.4	7.4	37.3	88.2	2.9
5.0	3.0%	67.1%	7.4	7.4	37.3	88.2	2.7
6.0	5.4%	72.4%	7.4	7.4	37.3	88.2	4.7
7.0	4.4%	76.8%	7.4	7.4	37.3	88.2	3.8
8.0	3.5%	80.3%	7.4	7.4	37.3	88.2	3.1
9.0	2.8%	83.2%	7.4	7.4	37.3	88.2	2.5
10.0	2.2%	85.3%	7.4	7.4	37.3	88.2	1.9
15.0	7.0%	92.3%	7.4	7.4	37.3	88.2	6.2
20.0	4.5%	96.9%	7.4	7.4	37.3	88.2	4.0
25.0	1.4%	98.3%	7.4	7.4	37.3	88.2	1.3
30.0	0.7%	99.0%	7.4	7.4	37.3	88.2	0.6
35.0	0.5%	99.5%	7.4	7.4	37.3	88.2	0.4
40.0	0.5%	100.0%	7.4	7.4	37.3	88.2	0.5
45.0	0.0%	100.0%	7.4	7.4	37.3	88.2	0.0
50.0	0.0%	100.0%	7.4	7.4	37.3	88.2	0.0
							90.1
						Removal Efficiency Adjustment[2] =	6.5%
						Predicted Net Annual Load Removal Efficiency =	**83.6%**
						Predicted % Annual Rainfall Treated =	**99.0%**

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CDS Stormwater Treatment Unit Performance

Table 1. Fine Particle Size Distribution (PSD)

Particle Size (µm)	% of Particle Mass
< 20	20
20 – 40	10
40 – 60	10
60 – 130	20
130 – 400	20
400 – 2000	20

Removal Efficiencies – CDS Unit Testing Under Various Flow Rates

The following performance curves are based on controlled tests using a full scale CDS Model PMSU20_20 (2400 micron screen), 1.1-cfs (494-gpm) capacity treatment unit.

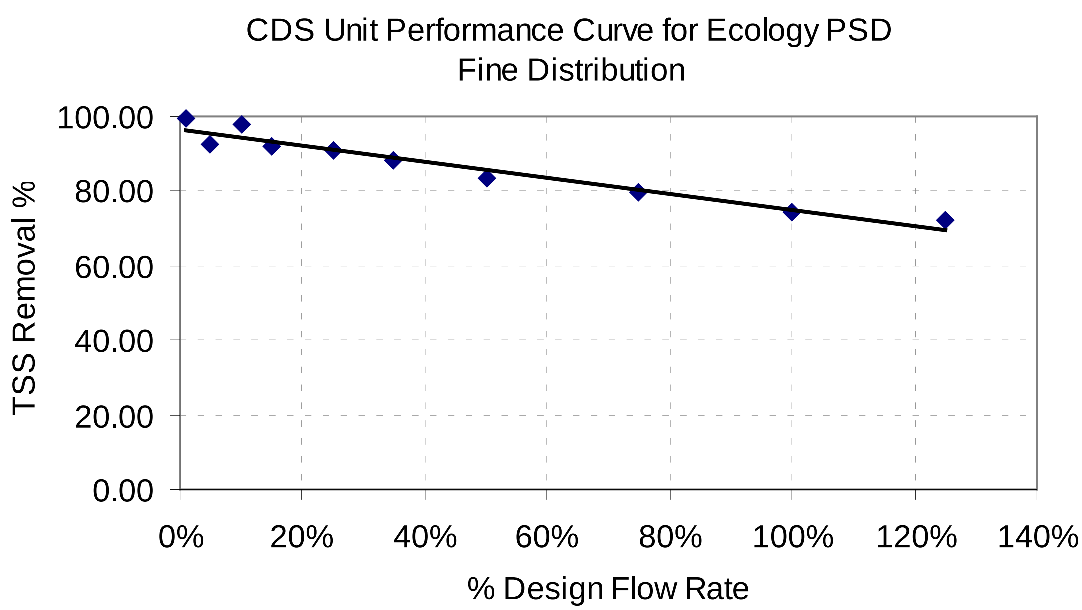


Figure 1. CDS Unit Performance for Fine PSD

CDS Unit Performance Testing Protocol

Tests were conducted using two types of sand – U.S. Silica OK-110 and UF sediment (a mixture of U.S. Silica sands). Particle size gradations for the two types of sand are illustrated in Figure 2.

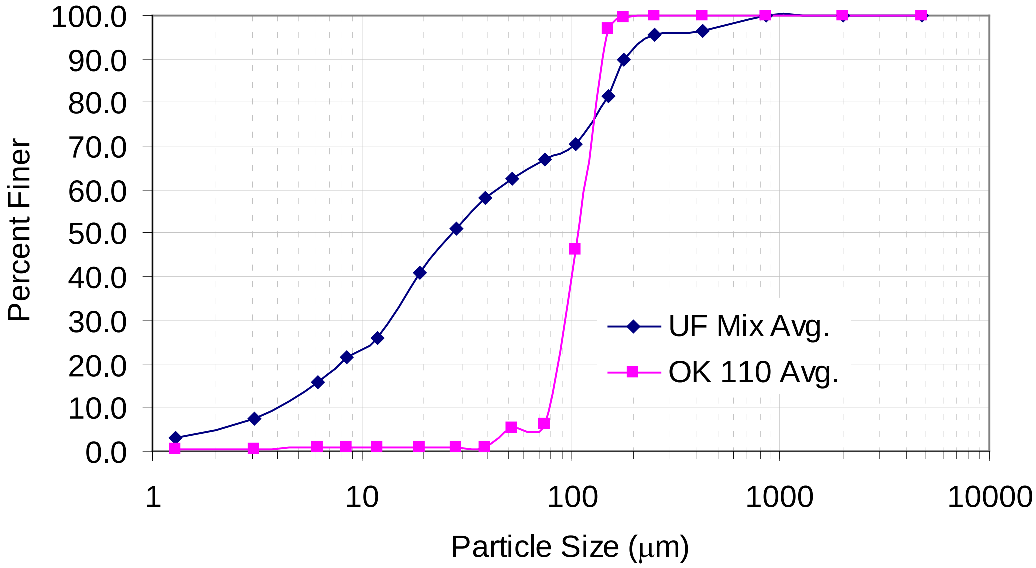


Figure 2. Test material particle size gradations - CDS Model PMSU20_20 test
(Analytical results provided by MACTEC Engineering and Consulting Inc. FL
ASTM D-422 with Hydrometer method)

The influent concentration (mg/L) for the test was set at 200-mg/L and verified from slurry feeding. Effluent samples were taken at fixed time intervals during each test run at various flow rates. The composite effluent samples were sent to Test American Analytical Testing Lab, OR for TSS analysis (ASTM D3977-97).

TSS removal rates for the specified PSD (d_{50} of 90 μm) under various flow rates were calculated from Figure 2 shows the removal efficiency as a function of operating flow rate. This removal efficiency curve as a function of percent flow rate can be applied to all CDS unit models.

505 Hood Road Unit 26 Markham ON L3R 5V6
Tel: (905) 948-0000 Fax: (905) 948-0577
E-mail: info@echelonenvironmental.ca

APPENDIX II
ANTICIPATED GRIT LOAD/CLEANING CYCLE

ECHELON ENVIRONMENTAL

Phone: 905-948-0000
Fax: 905-948-0577
info@echelonenvironmental.ca
www.echelonenvironmental.ca

Estimate of Annual Grit Collection

Engineer: **Novatech Engineeirng**
Contact: Mr/ S. Mathews P.Eng
Report Date:

Project: Ahlul Bayt Centre
Model: PMSU20_15_4
OGS Location: OGS 1

Area :	1.37	ha
Imperviousness :	90	%
Runoff Coefficient :	0.84	

Assumptions:

1. Annual Rainfall	919	mm	
2. Typical Grit Concentration	300	mg/l	
3. Apparent Grit Density	1.7	kg/l	(estimated)
4. Grit Capture Efficiency	50%		

Runoff Volume = Area x Rainfall Depth x Runoff Coefficient = 10,576 cu.m

Grit Collected = Grit Concentration x Runoff Volume x Grit Capture Efficiency = 1,586 kg

Grit Volume = Mass / Apparent Density = 933 litres or 0.933 cu.m

<u>Therefore it can be expected that this site will generate approximately 0.933cu.m of grit annually.</u>

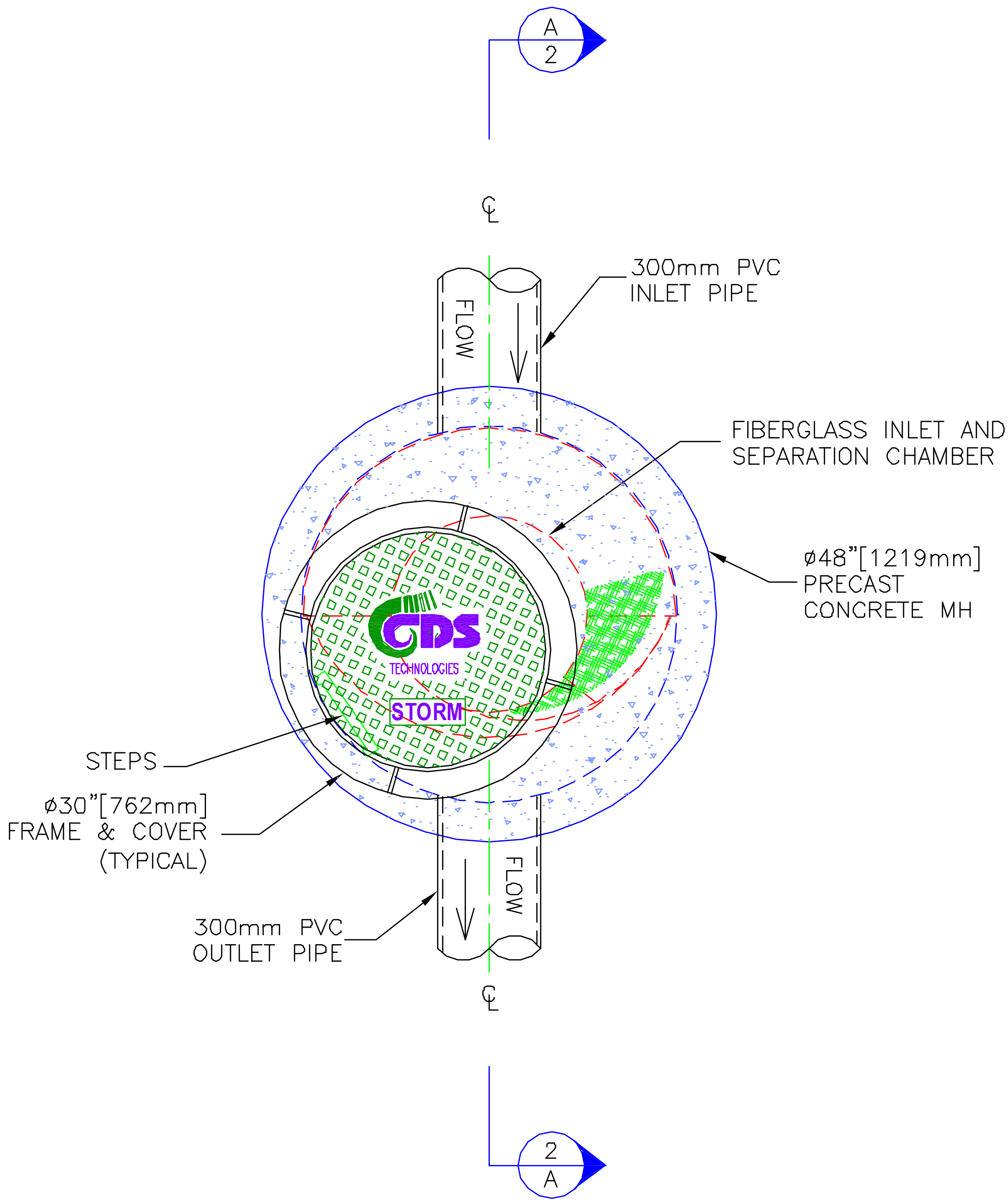
Sump Capacity of CDS unit = 1.016 cu.m

Therefore the design sump capacity will accommodate a cleaning frequency of one time per 24 months.

ECHELON ENVIRONMENTAL
505 Hood Road Unit 26 Markham ON L3R 5V6
Tel: (905) 948-0000 Fax: (905) 948-0577
E-mail: info@echelonenvironmental.ca

APPENDIX III
CDS PMSU 20_15_4 Cutsheet/Reference DRAWING

PLAN VIEW

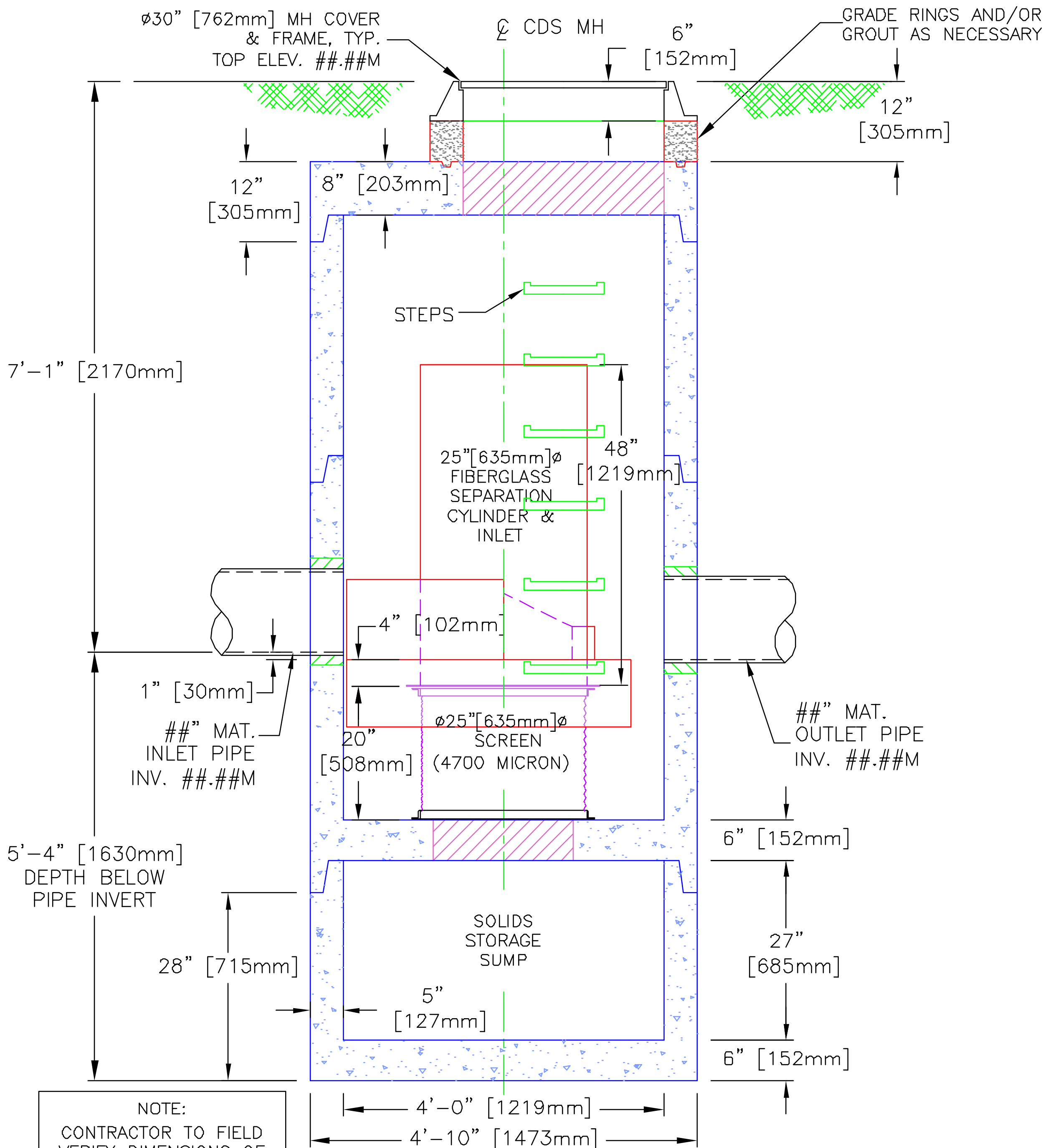


CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB#	XX-##-###	SCALE 1" = 2'
		DATE	##/##/##	SHEET
		DRAWN	INITIALS	1
		APPROV.		

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

SECTION A–A
ELEVATION VIEW



NOTE:
CONTRACTOR TO FIELD VERIFY DIMENSIONS OF OR CONCRETE SECTIONS

CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT

PROJECT NAME CITY, STATE	JOB#	XX–##–###	SCALE 1" = 2'
	DATE	##/##/##	SHEET
	DRAWN	INITIALS	2
	APPROV.		

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

505 Hood Road Unit 26 Markham ON L3R 5V6
Tel: (905) 948-0000 Fax: (905) 948-0577
E-mail: info@echelonenvironmental.ca

APPENDIX IV
Ontario Provincial Standards Approval
MOE Certificate

TECHNOLOGY ASSESSMENT • TECHNOLOGY ASSESSMENT

CERTIFICATE

OF TECHNOLOGY ASSESSMENT

CDS™ Technologies

The Ontario Ministry of the Environment has reviewed the solid/liquid separation system developed by ***CDS™ Technologies****. Based on the review of the documentation submitted by the company (see the Notable Aspects section and Appendix), and data from pilot-scale testing and full-scale operations conducted by various agencies, the Ministry concludes that the continuous deflection separation (CDS™) system can provide useful removal of solids and floatables as part of a stormwater management system.*

The CDS™ Technologies may be able to provide "basic to enhanced" level of protection when used alone, maintained for effective operation, and when appropriately designed for the development area to be serviced. CDS™ units may also be used for pretreatment in combination with other non-proprietary technologies such as man-made wetlands, treatment ponds and infiltration basins.

J R Mayes

John Mayes, (A) Director
Standards Development Branch
Ministry of the Environment
(September 2006)

New Environmental Technology Evaluation Program

Promoting the development and application of new environmental technologies

Ontario

TECHNOLOGY ASSESSMENT • TECHNOLOGY ASSESSMENT

150 · 07 · 2000

Echelon Environmental

Supplier of stormwater treatment systems
Category: **Distributor**

Products

** For product details select the down arrow.*

Info **CDS Technologies Precast Manhole Stormwater Unit (PMSU)**

Info **ChamberMaxx**

Products Distributed

Contech Construction Products Inc.

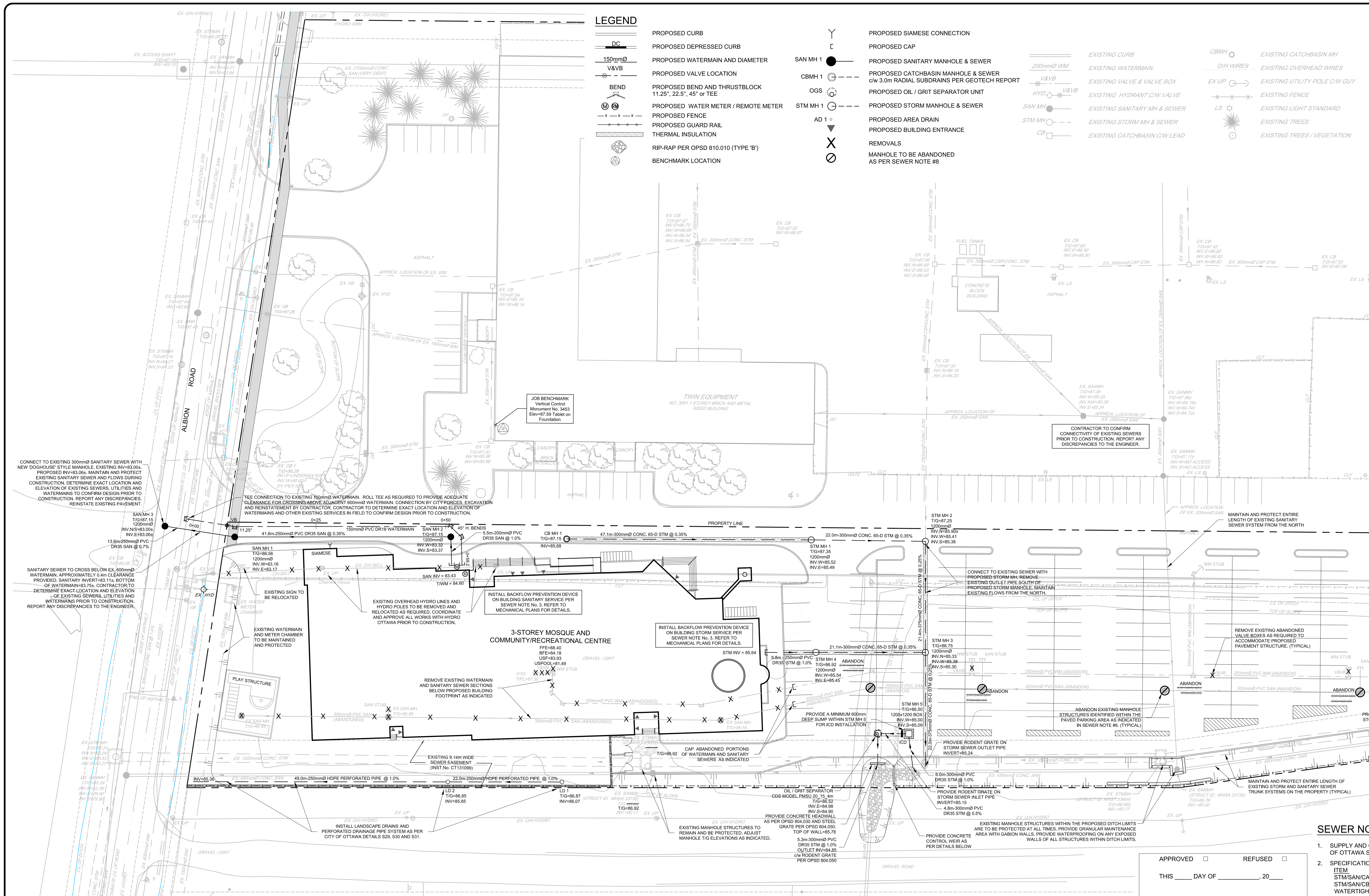
CDS®

Using patented continuous deflective separation technology, the CDS® system, effectively screens, separates and traps debris, sediment, and oil from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material, without blinding. It is available in offline, inline, and grate inlet configurations. The unique inlet design provides more ways to receive stormwater in a single treatment unit. Its unique forebay design allows it to receive single or multiple pipes on a 170º arc. If needed, the system can perform as a catch basin or drop inlet and receive flow from the rest of the drainage collection system ? eliminating the need for additional structures. An oil baffle skirt surrounding the non-blocking screening process traps oil and grease. It separates previously captured oil and grease from high bypass flows, preventing re-entrainment. The CDS® system is available in precast or cast-in-place. Offline units can treat flows from 1 to 300 cfs (30 to 8500 L/s). Inline units can treat up to 7.5 cfs (170 L/s), and internally bypass larger flows in excess of 50 cfs (1420 L/s). The pollutant removal capability of the CDS system has been proven in the lab and field.

Contacts
Rob Rainford, P.Eng.
General Manager
Echelon Environmental
505 Hood Road, Unit #26
Markham, ON L3R 5V6
Phone: 905-948-0000 x225
Fax: 905-948-0577
Cellular: 416-899-0553
Email: **rob@echelonenvironmental.ca**
Web: **http://www.echelonenvironmental.ca**

APPENDIX G

Engineering Drawings



150mmØ PVC DR18 WATERMAIN TABLE

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
0+00	86.63	84.03± ✻	ROLLED TEE CONNECTION TO EXISTING 150mmØ WM
0+02.2	86.62	84.94 ✻✻	22.5° VERTICAL BEND
0+02.8	86.61	84.94 ✻✻	CROSSING ABOVE EX. 600mmØ WM (0.25m± CLEARANCE)
0+03.4	86.60	84.94 ✻✻	22.5° VERTICAL BEND
0+05.2	86.59	84.19	22.5° VERTICAL BEND
0+05.8	86.58	84.18	CROSSING BELOW EX. GAS LINE (1.4m± CLEARANCE)
0+07.9	86.57	84.17	150mm V&VB @ PROPERTY LINE
0+09.4	86.59	84.19 ✻✻	11.25° HORIZONTAL BEND
0+25	86.82	84.42	- - -
0+50	87.12	84.55 ✻✻	- - -
0+50.9	87.13	84.55 ✻✻	45° HORIZONTAL BEND
0+53.8	87.17	84.60 ✻✻	45° HORIZONTAL BEND
0+59.2	87.25	84.60	CAP 1.0m FROM BUILDING FACE

✻ 150mmØ TEE CONNECTION TO EX. 150mmØ WM. EXACT ELEVATION TO BE FIELD DETERMINED.

✻✻ PROVIDE THERMAL INSULATION AS PER CITY OF OTTAWA DETAIL W23 ADJACENT TO OPEN STRUCTURES AND DETAIL W22 WHERE COVER IS LESS THAN 2.4m.

WATERMAIN NOTES:

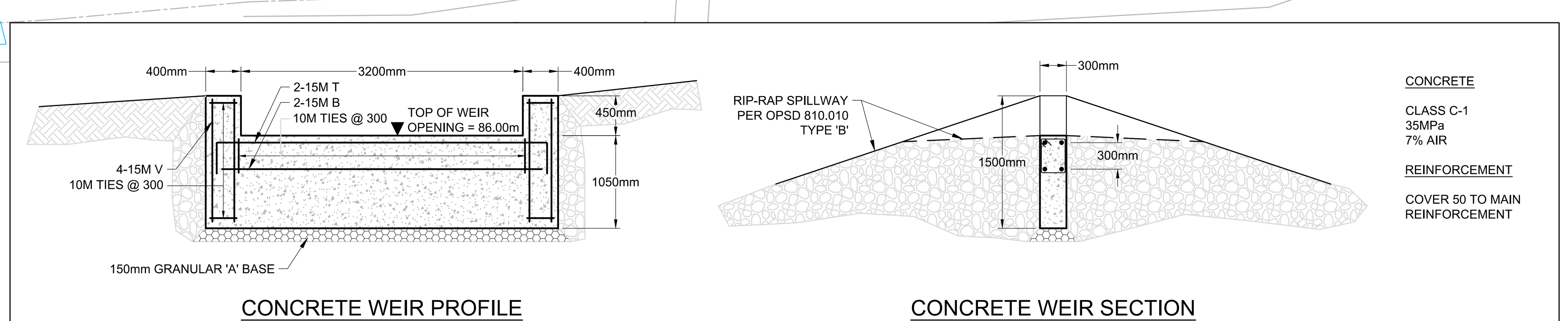
1. SUPPLY AND CONSTRUCT ALL WATERMAIN AND APPURTENANCES IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN TRENCHING	W17	CITY OF OTTAWA
THERMAL INSULATION IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
THERMAL INSULATION BY OPEN STRUCTURES	W23	CITY OF OTTAWA
WATERMAIN CROSSING BELOW SEWERS	W25	CITY OF OTTAWA
WATERMAIN	PVC DR 18	

3. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY CITY OFFICIALS.
4. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
5. PROVIDE MINIMUM 0.5m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS, UNLESS OTHERWISE INDICATED.
6. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, UNLESS OTHERWISE INDICATED.

INLET CONTROL DEVICE DATA - STM MH 5

TEMPEST VORTEX ICD	DIAMETER OF OUTLET PIPE	DESIGN FLOW	DESIGN HEAD	WATER ELEVATION
IPEX LMF 95	300mm Ø	7.4 L/s	0.83 m	85.98 m



CONCRETE WEIR PROFILE
SCALE 1:50

CONCRETE WEIR SECTION
SCALE 1:50

APPROVED ☐ REFUSED ☐

THIS _____ DAY OF ____________, 20____

DON HERWEYER, MCIP, RPP, MANAGER
DEVELOPMENT REVIEW SOUTH
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $2,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ALL ORGANIC MATERIAL AND DEBRIS.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT No. PG3635-1 PREPARED BY PATERSON GROUP INC. FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION FOR ALL PARKING ACCESS\ ROADWAY ACCESS, PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
9. REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' No. R-2015-048 PREPARED BY NOVATECH.
10. REFER TO ARCHITECTS DRAWING FOR BUILDING AND HARD SURFACE AREAS AND DIMENSIONS.
11. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
12. PROVIDE LINE/PARKING PAINTING.

SEWER NOTES:

1. SUPPLY AND CONSTRUCT ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
STM/SAN/CATCHBASIN MANHOLE (1200Ø / 1200x1200)	701.010 / M-4	OPSD/M-CON (or APPROVED EQ)
STM/SAN/CBMH FRAME AND COVER	S24.1 / S24 / S25	CITY OF OTTAWA
WATERTIGHT MANHOLE FRAME AND COVER	401.030	OPSD
CATCHBASIN (600x600)	705.010	OPSD
CATCHBASIN FRAME AND COVER	400.020	OPSD
STORM SEWER	PVC DR 35 / CONC. 65D	
SANITARY SEWER	PVC DR 35	
SUBDRAIN	HDPE PERF. / NON-PERF. PIPE	

SEWER TRENCH - BEDDING (GRANULAR 'A')
COVER (GRANULAR 'A' OR GRANULAR 'B' TYPE I WITH MAX. PARTICLE SIZE=25mm)

3. ALL STORM AND SANITARY SERVICE LATERALS SHALL BE EQUIPPED WITH BACKFLOW PREVENTERS AS PER THE CITY OF OTTAWA STANDARD DETAILS S14 AND S14.1 OR S14.2.
4. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
5. INSULATE ALL SANITARY AND STORM SEWER PIPES THAT HAVE LESS THAN 1.5m COVER WITH HI-40 RIGID INSULATION. REFER TO SHALLOW SEWER INSULATION DETAIL ON DRAWING 113093-GP2. PROVIDE FROST TAPERS AS PER OPSD 803.031.
6. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTING PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL). THE CONCRETE CRADLE FOR THE PIPE CAN BE ELIMINATED.
7. ALL STORM MANHOLES AND CATCHBASIN MANHOLES ARE TO HAVE MINIMUM 300mm SUMPS UNLESS OTHERWISE INDICATED. ALL CATCHBASINS ARE TO HAVE MINIMUM 600mm SUMPS UNLESS OTHERWISE INDICATED. ALL STORM MANHOLES AND CATCHBASIN MANHOLES THAT HAVE ICDs INSTALLED WITHIN THE OUTLET PIPES ARE TO HAVE MINIMUM 600mm SUMPS TO ACCOMMODATE THE ICD.
8. EXISTING SANITARY MANHOLES THAT ARE IDENTIFIED ON THE PLANS TO BE ABANDONED WITHIN THE NEW PAVED PARKING AREA ARE TO HAVE THE FRAME AND GRATES REMOVED ALONG WITH ANY RISER SECTIONS NECESSARY TO COMPLETE THE GRANULAR SUB-BASE FOR THE PAVEMENT. FILL THE BASE OF THE MANHOLES WITH 2" STONE TO THE OBVERT OF THE ABANDONED PIPES. FILL THE REMAINDER OF THE MANHOLE WITH SAND TO THE REQUIRED SUB-BASE ELEVATION.
9. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 250mmØ OR GREATER TO ENSURE THAT THEY ARE CLEAN AND OPERATIONAL. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES. OBTAIN APPROVAL FROM THE CITY'S SEWER OPERATIONS.
10. THE OWNER SHALL REQUIRE THAT THE SITE SERVICING CONTRACTOR PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDNCE WITH OPSS 410.07.16, 410.07.16.04 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF A CERTIFIED PROFESSIONAL ENGINEER WHO SHALL SUBMIT A CERTIFIED COPY OF THE TEST RESULTS.
11. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES INDICATING ALL APPLICABLE SERVICING AS-BUILT INFORMATION SHOWN ON THIS PLAN. AS-BUILT INFORMATION MUST INCLUDE: SEWER AND WATER PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS AND ANY ALIGNMENT CHANGES, ETC.

D07-12-16-0025

KEY PLAN
N.T.S.

The position of all pole lines, conduits, watermains, sewers and other underground and above ground utilities and structures is not necessarily shown on the contract drawings, and where shown, the accuracy of the position of such utilities and structures is not guaranteed. Before starting work, determine the exact location of all such utilities and structures and assume all liability for damage to them.

SITE BENCHMARK
REFERENCED TO LOCAL GEODETIC DATUM AS INDICATED ON DRAWING. SEE EXISTING VERTICAL CONTROL MONUMENT No.3453 (TABLET ON FOUNDATION) ON SOUTH-WEST CORNER OF BUILDING LOCATED AT 3091 ALBION ROAD NORTH.

OWNER INFORMATION
AHLUL-BAYT CENTRE OTTAWA (ABCO)
200 BARIBEAU STREET
OTTAWA, ONTARIO, K1L 7R6

AKRAM FARHAT
PHONE: (613) 526-0774
E-MAIL: akromi@gmail.com

JAMES B. LENNOX & ASSOCIATES INC.
LANDSCAPE ARCHITECTS
3332 CARLING AVE. OTTAWA, ONTARIO K2H 5A8
Tel. (613) 722-5168 Fax. 1(866) 343-3942

LICENSED PROFESSIONAL ENGINEER
F.S. THAUVETTE
100041399
JAN. 6, 2017
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

NO.	DATE:	REVISION:
2	JAN. 6, 2017	REVISED PER CITY COMMENTS
1	JAN. 27, 2016	ISSUED FOR SITE PLAN APPROVAL

SJL
S. J. LAWRENCE
ARCHITECT INCORPORATED
18 Deakin Street, Suite 205, Nepean, ON K2E 8B7
Tel: (613) 739-7770 Fax: (613) 739-7703
Email: sjl@sjlarchitect.com

DRAWN BY:	DESIGNED BY:
SM	SM / FST
DATE: JANUARY 2016	CHECKED BY: FST
SCALE: 1:400	PLOT DATE: JAN. 27, 2016

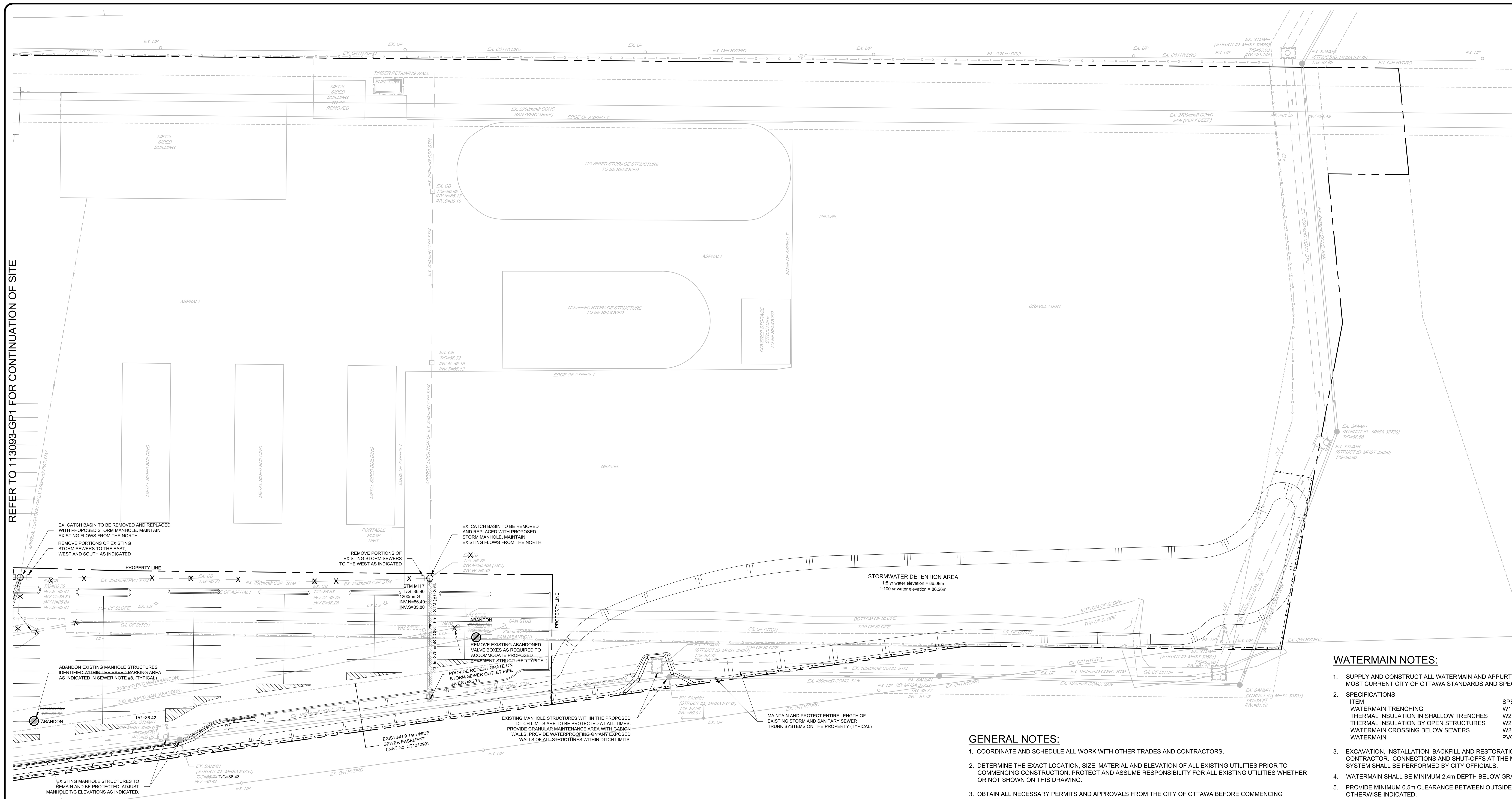
PROJECT:
AHLUL-BAYT CENTRE OTTAWA
3095 ALBION ROAD NORTH
OTTAWA, ONTARIO

NOVATECH JOB NO.: 113093-00

DRAWING NAME:
GENERAL PLAN OF SERVICES

113093-GP1

SHEET:



APPROVED ☐ REFUSED ☐

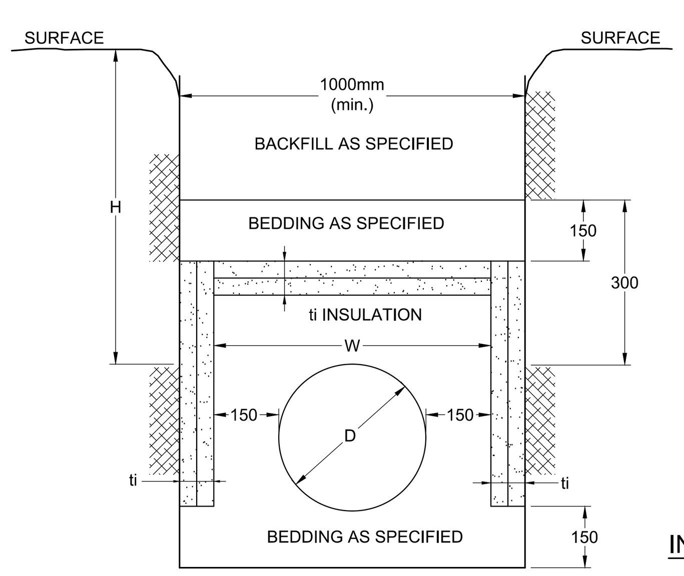
THIS _____ DAY OF ____________, 20____

DON HERWEYER, MCIP, RPP, MANAGER
DEVELOPMENT REVIEW SOUTH
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $2,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ALL ORGANIC MATERIAL AND DEBRIS.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT No. PG3635-1 PREPARED BY PATERSON GROUP INC. FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION FOR ALL PARKING ACCESS\ ROADWAY ACCESS, PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
9. REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' No. R-2015-048 PREPARED BY NOVATECH.
10. REFER TO ARCHITECTS DRAWING FOR BUILDING AND HARD SURFACE AREAS AND DIMENSIONS.
11. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
12. PROVIDE LINE/PARKING PAINTING.

INLET CONTROL DEVICE DATA - STM MH 5				
TEMPEST VORTEX ICD	DIAMETER OF OUTLET PIPE	DESIGN FLOW	DESIGN HEAD	WATER ELEVATION
IPEX LMF 95	300mm Ø	7.4 L/s	0.83 m	85.98 m



ti = THICKNESS OF INSULATION (mm)
h = DEPTH OF COVER
W = D + 300 (1000 min.)
W = WIDTH OF INSULATION (mm)
D = O.D OF PIPE (mm)

INSULATION NOTES:

1. THE THICKNESS OF SEWER INSULATION SHALL BE THE EQUIVALENT OF 25mm FOR EVERY 300mm REDUCTION IN THE REQUIRED DEPTH OF COVER LESS THAN 1500mm (SEE TABLE).

COVER (mm)	INSULATION THICKNESS (mm)
1500-1200	50
1200-900	75
900-600	100

INSULATION DETAIL FOR SHALLOW SEWERS ONLY

NOT TO SCALE

LEGEND

- PROPOSED CURB
- DC — PROPOSED DEPRESSED CURB
- 150mmØ — PROPOSED WATERMAIN AND DIAMETER
- V&VB — PROPOSED VALVE LOCATION
- BEND — PROPOSED BEND AND THRUSTBLOCK 11.25°, 22.5°, 45° or TEE
- M RM — PROPOSED WATER METER / REMOTE METER
- PROPOSED FENCE
- PROPOSED GUARD RAIL
- THERMAL INSULATION
- RIP-RAP PER OPSD 810.010 (TYPE 'B')
- BENCHMARK LOCATION
- PROPOSED SIAMESE CONNECTION
- PROPOSED CAP
- SAN MH 1 — PROPOSED SANITARY MANHOLE & SEWER
- CBMH 1 — PROPOSED CATCHBASIN MANHOLE & SEWER c/w 3.0m RADIAL SUBDRAINS PER GEOTECH REPORT
- OGS — PROPOSED OIL / GRIT SEPARATOR UNIT
- STM MH 1 — PROPOSED STORM MANHOLE & SEWER
- AD 1 — PROPOSED AREA DRAIN
- PROPOSED BUILDING ENTRANCE
- X — REMOVALS
- MANHOLE TO BE ABANDONED AS PER SEWER NOTE #8
- EXISTING CURB
- 200mmØ WM — EXISTING WATERMAIN
- V&VB — EXISTING VALVE & VALVE BOX
- HYD — EXISTING HYDRANT C/W VALVE
- SAN MH — EXISTING SANITARY MH & SEWER
- STM MH — EXISTING STORM MH & SEWER
- CB — EXISTING CATCHBASIN C/W LEAD
- CBMH — EXISTING CATCHBASIN MH
- O/H WIRES — EXISTING OVERHEAD WIRES
- EX UP — EXISTING UTILITY POLE C/W GUY
- EXISTING FENCE
- LS — EXISTING LIGHT STANDARD
- EXISTING TREES
- EXISTING TREES / VEGETATION

WATERMAIN NOTES:

1. SUPPLY AND CONSTRUCT ALL WATERMAIN AND APPURTENANCES IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN TRENCHING	W17	CITY OF OTTAWA
THERMAL INSULATION IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
THERMAL INSULATION BY OPEN STRUCTURES	W23	CITY OF OTTAWA
WATERMAIN CROSSING BELOW SEWERS	W25	CITY OF OTTAWA
WATERMAIN	PVC DR 18	

3. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY CITY OFFICIALS.
4. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
5. PROVIDE MINIMUM 0.5m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS, UNLESS OTHERWISE INDICATED.
6. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, UNLESS OTHERWISE INDICATED.

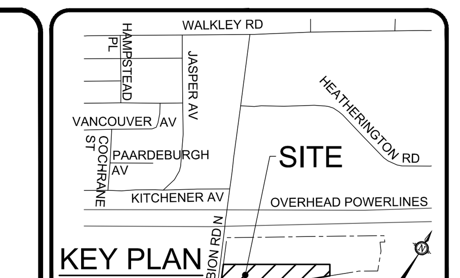
SEWER NOTES:

1. SUPPLY AND CONSTRUCT ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
STM/SAN/CATCHBASIN MANHOLE (1200Ø / 1200x1200)	701.010 / M-4	OPSD/M-CON (or APPROVED EQ)
STM/SAN/CBMH FRAME AND COVER	S24.1 / S24 / S25	CITY OF OTTAWA
WATERTIGHT MANHOLE FRAME AND COVER	401.030	OPSD
CATCHBASIN (600x600)	705.010	OPSD
CATCHBASIN FRAME AND COVER	400.020	OPSD
STORM SEWER	PVC DR 35 / CONC. 65D	
SANITARY SEWER	PVC DR 35	
SUBDRAIN	HDPE PERF. / NON-PERF. PIPE	
SEWER TRENCH - BEDDING (GRANULAR 'A') COVER (GRANULAR 'A' OR GRANULAR 'B' TYPE I WITH MAX. PARTICLE SIZE=25mm)		

3. ALL STORM AND SANITARY SERVICE LATERALS SHALL BE EQUIPPED WITH BACKFLOW PREVENTERS AS PER THE CITY OF OTTAWA STANDARD DETAILS S14 AND S14.1 OR S14.2.
4. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
5. INSULATE ALL SANITARY AND STORM SEWER PIPES THAT HAVE LESS THAN 1.5m COVER WITH HI-40 RIGID INSULATION. REFER TO SHALLOW SEWER INSULATION DETAIL ON DRAWING 113093-GP2. PROVIDE FROST TAPERS AS PER OPSD 803.031.
6. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTING PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL). THE CONCRETE CRADLE FOR THE PIPE CAN BE ELIMINATED.
7. ALL STORM MANHOLES AND CATCHBASIN MANHOLES ARE TO HAVE MINIMUM 300mm SUMPS UNLESS OTHERWISE INDICATED. ALL CATCHBASINS ARE TO HAVE MINIMUM 600mm SUMPS UNLESS OTHERWISE INDICATED. ALL STORM MANHOLES AND CATCHBASIN MANHOLES THAT HAVE ICDs INSTALLED WITHIN THE OUTLET PIPES ARE TO HAVE MINIMUM 600mm SUMPS TO ACCOMMODATE THE ICD.
8. EXISTING SANITARY MANHOLES THAT ARE IDENTIFIED ON THE PLANS TO BE ABANDONED WITHIN THE NEW PAVED PARKING AREA ARE TO HAVE THE FRAME AND GRATES REMOVED ALONG WITH ANY RISER SECTIONS NECESSARY TO COMPLETE THE GRANULAR SUB-BASE FOR THE PAVEMENT. FILL THE BASE OF THE MANHOLES WITH 2" STONE TO THE OBVERT OF THE ABANDONED PIPES. FILL THE REMAINDER OF THE MANHOLE WITH SAND TO THE REQUIRED SUB-BASE ELEVATION.
9. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 250mmØ OR GREATER TO ENSURE THAT THEY ARE CLEAN AND OPERATIONAL. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES. OBTAIN APPROVAL FROM THE CITY'S SEWER OPERATIONS.
10. THE OWNER SHALL REQUIRE THAT THE SITE SERVICING CONTRACTOR PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDNCE WITH OPSS 410.07.16, 410.07.16.04 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF A CERTIFIED PROFESSIONAL ENGINEER WHO SHALL SUBMIT A CERTIFIED COPY OF THE TEST RESULTS.
11. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES INDICATING ALL APPLICABLE SERVICING AS-BUILT INFORMATION SHOWN ON THIS PLAN. AS-BUILT INFORMATION MUST INCLUDE: SEWER AND WATER PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS AND ANY ALIGNMENT CHANGES, ETC.

D07-12-16-0025



KEY PLAN
N.T.S.

The position of all pole lines, conduits, watermains, sewers and other underground and above ground utilities and structures is not necessarily shown on the contract drawings, and where shown, the accuracy of the position of such utilities and structures is not guaranteed. Before starting work, determine the exact location of all such utilities and structures and assume all liability for damage to them.

SITE BENCHMARK
REFERENCED TO LOCAL GEODETIC DATUM AS INDICATED ON DRAWING. SEE EXISTING VERTICAL CONTROL MONUMENT No.3453 (TABLET ON FOUNDATION) ON SOUTH-WEST CORNER OF BUILDING LOCATED AT 3091 ALBION ROAD NORTH.

OWNER INFORMATION
AHLUL-BAYT CENTRE
OTTAWA (ABCO)
200 BARIBEAU STREET
OTTAWA, ONTARIO, K1L 7R6

AKRAM FARHAT
PHONE: (613) 526-0774
E-MAIL: akromi@gmail.com

JAMES B. LENNOX & ASSOCIATES INC.
LANDSCAPE ARCHITECTS
3332 CARLING AVE. OTTAWA, ONTARIO K2H 5A8
Tel. (613) 722-5168 Fax. 1(866) 343-3942

LICENSED PROFESSIONAL ENGINEER
F.S. THAUVETTE
100041399
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

NO.	DATE:	REVISION:
2	JAN. 6, 2017	REVISED PER CITY COMMENTS
1	JAN. 27, 2016	ISSUED FOR SITE PLAN APPROVAL

SJL
S. J. LAWRENCE
ARCHITECT INCORPORATED
18 Deakin Street, Suite 205, Nepean, ON K2E 8B7
Tel: (613) 739-7770 Fax: (613) 739-7703
Email: sjl@sjlarchitect.com

DRAWN BY: SM	DESIGNED BY: SM / FST
DATE: JANUARY 2016	CHECKED BY: FST
SCALE: 1:400	PLOT DATE: JAN. 27, 2016

PROJECT:
AHLUL-BAYT CENTRE OTTAWA
3095 ALBION ROAD NORTH
OTTAWA, ONTARIO

NOVATECH JOB NO.: 113093-00

DRAWING NAME:
GENERAL PLAN OF SERVICES

113093-GP2

SHEET:

M:\2013\113093\CAD\Design\113093-GP.dwg, GP2, Jan 09, 2017 - 3:22pm, smatthews

Erosion and Sediment Control Responsibilities:

	ESC Measure	Symbol	Specification	During Construction: Installation Responsibility	During Construction: Inspection/Maintenance Responsibility	During Construction: Inspection Frequency	After Construction Prior to Final Acceptance: Approval to Remove	After Construction Prior to Final Acceptance: Removal Responsibility	After Final Acceptance: Inspection/Maintenance Responsibility
Temporary Measures	Silt Fence	— · · —	OPSD 219.110	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Filter Fabric	Location as Indicated On Plans	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Rip-Rap	(rip-rap symbol)	OPSD 810.010 'B'	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Straw Bale Check Dam	(straw bale symbol)	OPSD 219.180	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Mud Mat	M M	Drawing Details	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Dust Control	Location as Required Around Site	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Stabilized Material Stockpiling	Location as Required by Contractor	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Sediment Basin (for flows being pumped out of excavations)	Location as Required by Contractor	- - -	Developer's Contractor	Developer's Contractor	After Every Rainstorm	Developer's Contractor	Developer's Contractor	N/A

GRADING NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED BUILDING AND PAVED AREAS.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUBEXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS.
3. THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 100% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
4. GRADE AND/OR FILL BEHIND PROPOSED CURB AND BETWEEN BUILDINGS AND CURBS, WHERE REQUIRED, TO PROVIDE POSITIVE DRAINAGE.
5. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
6. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
7. ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).
8. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.
9. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING THE AS-BUILT ELEVATION OF EVERY DESIGN GRADE SHOWN ON THIS PLAN.

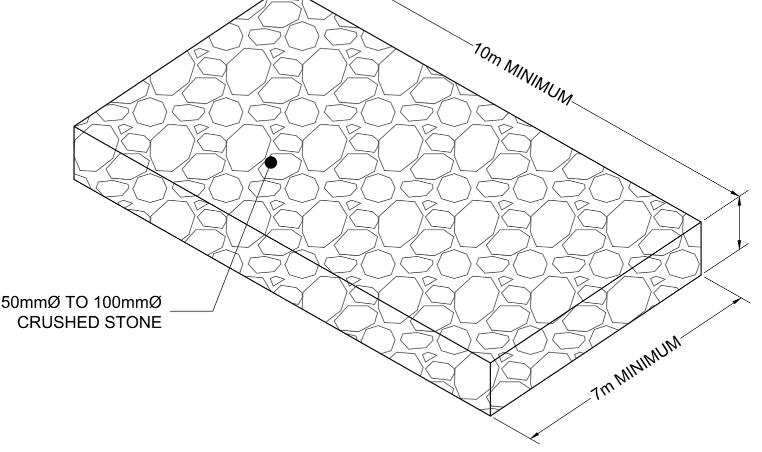
LEGEND

86.80	PROPOSED ELEVATION
85.28(S)	PROPOSED SWALE ELEVATION
86.55(T/W)	PROPOSED TOP OF WALL ELEVATION
86.75(T/S)	PROPOSED TOP OF SLOPE ELEVATION
85.60(B/S)	PROPOSED BOTTOM OF SLOPE ELEVATION
86.92(T/C)	PROPOSED TOP OF CURB ELEVATION
88.40	PROPOSED ELEVATION
+ 86.68	EXISTING ELEVATION
2.0%	GRADE AND DIRECTION
	MAXIMUM 3:1 SIDESLOPE
	DIRECTION OF MAJOR OVERLAND FLOW
	℄ SWALE AND DIRECTION OF FLOW
	PROPOSED SILT FENCE
	PROPOSED CURB
	RIP-RAP PER OPSD 810.010 (TYPE 'B')
DC	PROPOSED DEPRESSED CURB
CC	PROPOSED 1.0m WIDE CURB CUT
V&VB	PROPOSED VALVE & VALVE BOX
SAN MH 1	PROPOSED SANITARY MH
CBMH 1	PROPOSED CATCHBASIN MH
STM MH 1	PROPOSED STORM MH
AD 1	PROPOSED AREA DRAIN
	PROPOSED BUILDING ENTRANCE
	PROPOSED GABION BASKET RETAINING WALL
	PROPOSED GUARD RAIL
— X — X —	PROPOSED 1.8m HIGH CHAIN LINK FENCE
	EXISTING CURB
V&VB	EXISTING VALVE & VALVE BOX
HYD	EXISTING HYDRANT C/W VALVE
	BENCHMARK LOCATION
	APPROXIMATE PONDING LIMITS
SAN MH	EXISTING SANITARY MH
STM MH	EXISTING STORM MH
CB	EXISTING CATCHBASIN
CBMH	EXISTING CATCHBASIN MH
LS	EXISTING LIGHT STANDARD
	EXISTING TREES
X	REMOVALS
⊘	MANHOLE TO BE ABANDONED AS PER SEWER NOTE #8

PAVEMENT STRUCTURES:

LIGHT DUTY PAVEMENT
50mm SUPERPAVE 12.5 (TRAFFIC LEVEL B)
150mm GRAN "A"
300mm GRAN "B" TYPE II
ASPHALT GRADE PG 58-34

HEAVY DUTY NEW PAVEMENT
40mm SUPERPAVE 12.5 (TRAFFIC LEVEL B)
50mm SUPERPAVE 19.0 (TRAFFIC LEVEL B)
150mm GRAN "A"
450mm GRAN "B" TYPE II
ASPHALT GRADE PG 58-34

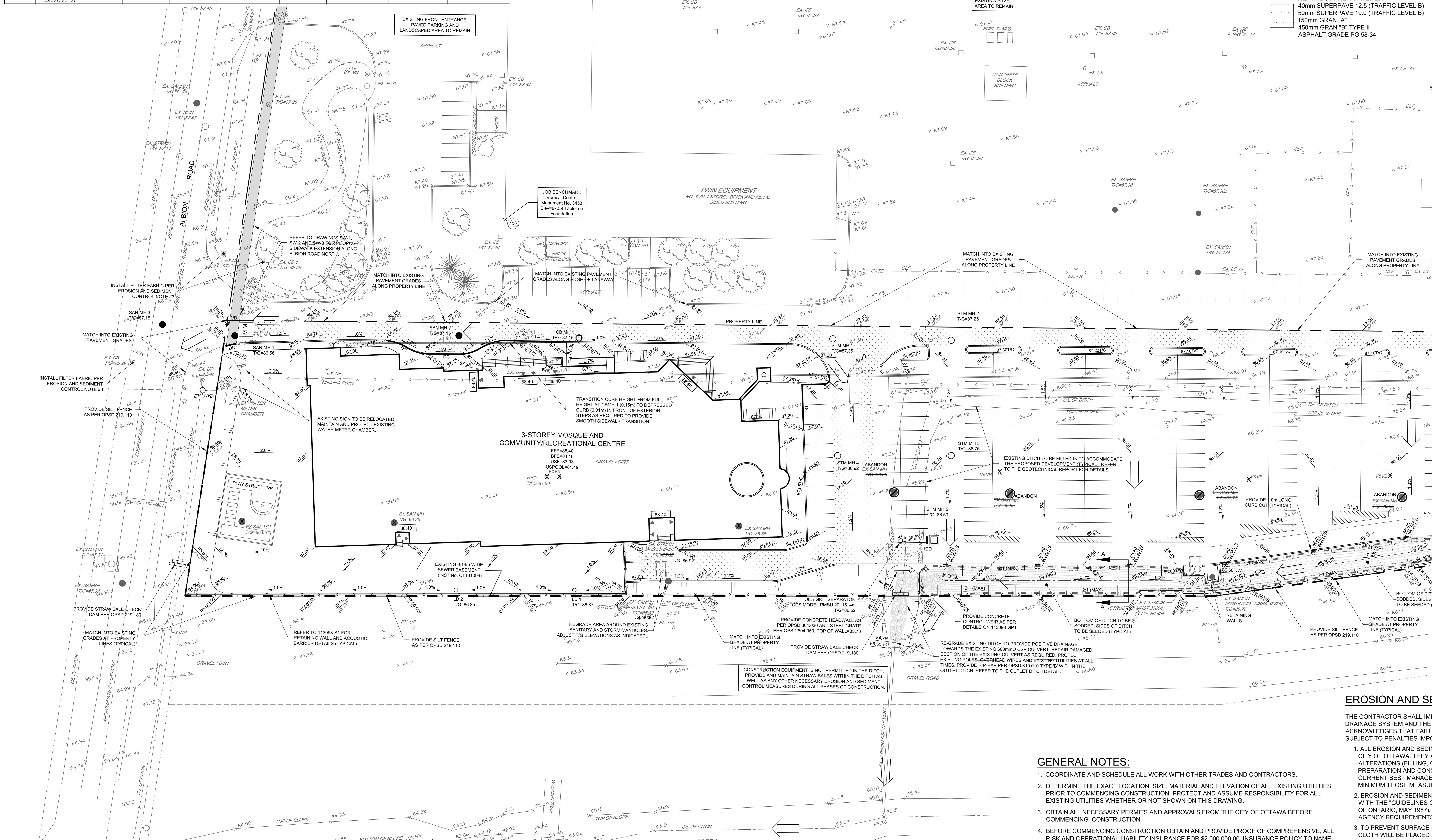


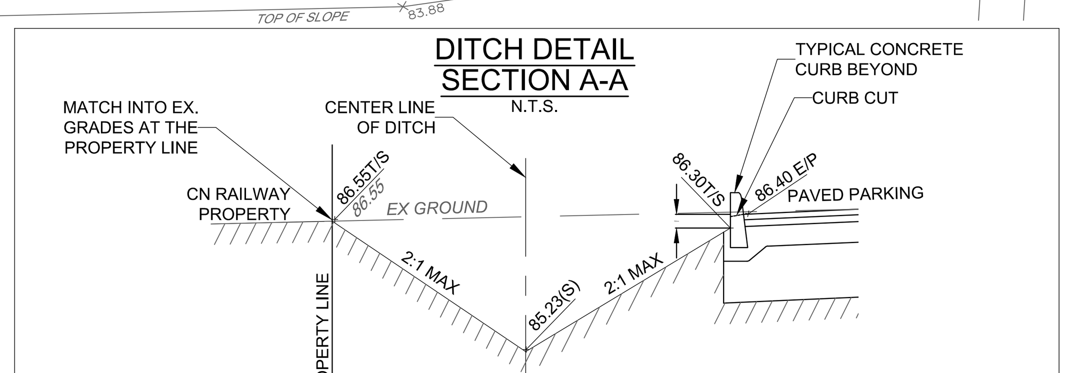
MUD MAT DETAIL
NOT TO SCALE

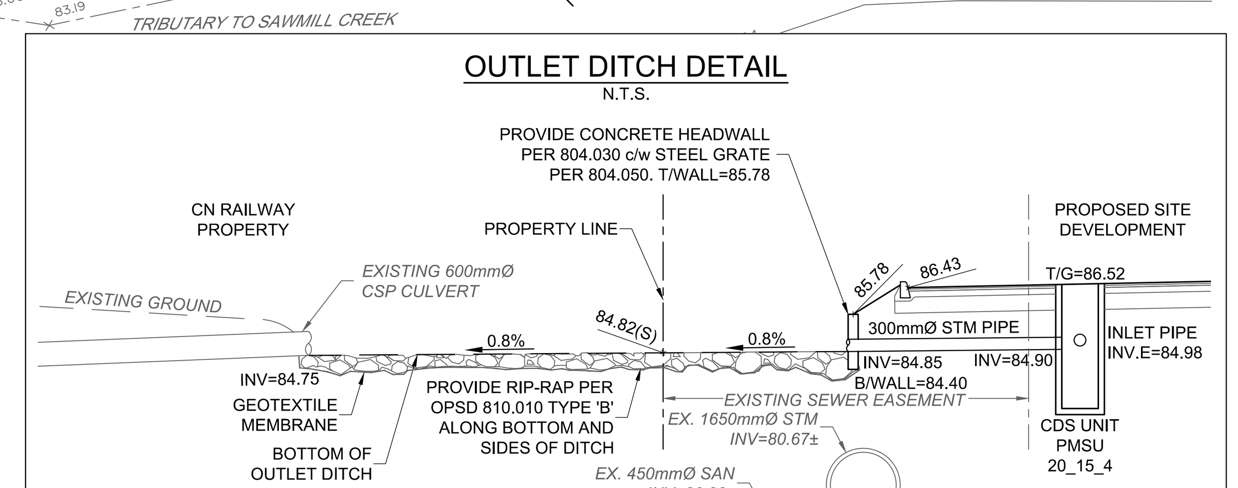
APPROVED ☐ REFUSED ☐

THIS ____ DAY OF __________, 20___

DON HERWEYER, MCIP, RPP, MANAGER
DEVELOPMENT REVIEW SOUTH
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA







GENERAL NOTES:

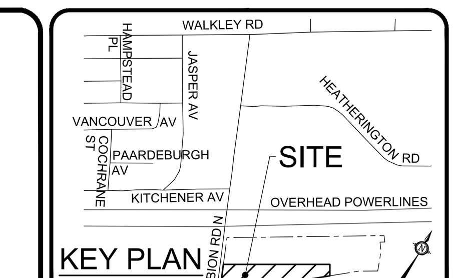
1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $2,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ALL ORGANIC MATERIAL AND DEBRIS.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT No. PG3635-1 PREPARED BY PATERSON GROUP INC. FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION FOR ALL PARKING ACCESS\ ROADWAY ACCESS, PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
9. REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' No. R-2015-048 PREPARED BY NOVATECH.
10. REFER TO ARCHITECTS DRAWING FOR BUILDING AND HARD SURFACE AREAS AND DIMENSIONS.
11. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
12. PROVIDE LINE/PARKING PAINTING.

EROSION AND SEDIMENT CONTROL NOTES :

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

1. ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED TO THE SATISFACTION OF THE ENGINEER AND THE CITY OF OTTAWA. THEY ARE TO BE APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION. THESE PRACTICES ARE TO BE IMPLEMENTED IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL AND SHOULD INCLUDE AS A MINIMUM THOSE MEASURES INDICATED ON THE PLAN.
2. EROSION AND SEDIMENT CONTROL MEASURES WILL BE IMPLEMENTED DURING CONSTRUCTION IN ACCORDANCE WITH THE "GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES" (GOVERNMENT OF ONTARIO, MAY 1987). THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEETING ALL REGULATORY AGENCY REQUIREMENTS.
3. TO PREVENT SURFACE EROSION FROM ENTERING ANY STORM SEWER SYSTEM DURING CONSTRUCTION, FILTER CLOTH WILL BE PLACED UNDER GRATES OF NEARBY CATCHBASINS AND STRUCTURES. A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED AROUND THE CONSTRUCTION AREA (WHERE APPLICABLE). THESE CONTROL MEASURES WILL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
4. TO LIMIT EROSION: MINIMIZE THE AMOUNT OF EXPOSED SOILS AT ANY GIVEN TIME, RE-VEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE AND PROTECT EXPOSED SLOPES WITH NATURAL OR SYNTHETIC MULCHES.
5. FOR MATERIAL STOCKPILING: MINIMIZE THE AMOUNT OF EXPOSED MATERIALS AT ANY GIVEN TIME; APPLY TEMPORARY SEEDING, TARPS, COMPACTION AND/OR SURFACE ROUGHENING AS REQUIRED TO STABILIZE STOCKPILED MATERIALS THAT WILL NOT BE USED WITHIN 14 DAYS.
6. THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE ENGINEER, THE MEASURES ARE NO LONGER REQUIRED. NO CONTROL MEASURES MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE ENGINEER.
7. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO ANY STORM SEWER SYSTEM. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
8. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
9. ROADWAYS ARE TO BE SWEPT AS REQUIRED OR AS DIRECTED BY THE ENGINEER AND/OR THE MUNICIPALITY.
10. THE CONTRACTOR SHALL ENSURE PROPER DUST CONTROL IS PROVIDED WITH THE APPLICATION OF WATER (AND IF REQUIRED, CALCIUM CHLORIDE) DURING DRY PERIODS. MONITOR DUST LEVELS DURING SITE PREPARATION/EXCAVATION, AND CONSTRUCTION ACTIVITIES, AND WHEN DUST LEVELS BECOME VISUALLY APPARENT SPRAY WATER TO MINIMIZE THE RELEASE OF DUST FROM GRAVEL, PAVED AREAS AND EXPOSED SOILS. USE CHEMICAL DUST SUPPRESSANTS ONLY WHERE NECESSARY ON PROBLEM AREAS.

D07-12-16-0025



KEY PLAN
N.T.S.

The position of all pole lines, conduits, watermains, sewers and other underground and above ground utilities and structures is not necessarily shown on the contract drawings, and where shown, the accuracy of the position of such utilities and structures is not guaranteed. Before starting work, determine the exact location of all such utilities and structures and assume all liability for damage to them.

SITE BENCHMARK
REFERENCED TO LOCAL GEODETIC DATUM AS INDICATED ON DRAWING. SEE EXISTING VERTICAL CONTROL MONUMENT No.3453 (TABLET ON FOUNDATION) ON SOUTH-WEST CORNER OF BUILDING LOCATED AT 3091 ALBION ROAD NORTH.

OWNER INFORMATION
AHLUL-BAYT CENTRE
OTTAWA (ABCO)
200 BARIBEAU STREET
OTTAWA, ONTARIO, K1L 7R6

AKRAM FARHAT
PHONE: (613) 526-0774
E-MAIL: akromi@gmail.com

JAMES B. LENNOX & ASSOCIATES INC.
LANDSCAPE ARCHITECTS
3332 CARLING AVE. OTTAWA, ONTARIO K2H 5A8
Tel. (613) 722-5168 Fax. 1(866) 343-3942

LICENSED PROFESSIONAL ENGINEER
F.S. THAUVETTE
100041399
JAN. 6, 2017
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

NORTH

NO.	DATE:	REVISION:
2	JAN. 6, 2017	REVISED PER CITY COMMENTS
1	JAN. 27, 2016	ISSUED FOR SITE PLAN APPROVAL

SJL
S. J. LAWRENCE
ARCHITECT INCORPORATED
18 Deakin Street, Suite 205, Nepean, ON K2E 8B7
Tel: (613) 739-7770 Fax: (613) 739-7703
Email: sjl@sjlarchitect.com

DRAWN BY: SM	DESIGNED BY: SM / FST
DATE: JANUARY 2016	CHECKED BY: FST
SCALE: 1:400	PLOT DATE: JAN. 27, 2016

PROJECT:
AHLUL-BAYT CENTRE OTTAWA
3095 ALBION ROAD NORTH
OTTAWA, ONTARIO

NOVATECH JOB NO.: 113093-00

DRAWING NAME:
GRADING AND EROSION & SEDIMENT CONTROL PLAN

113093-GR1

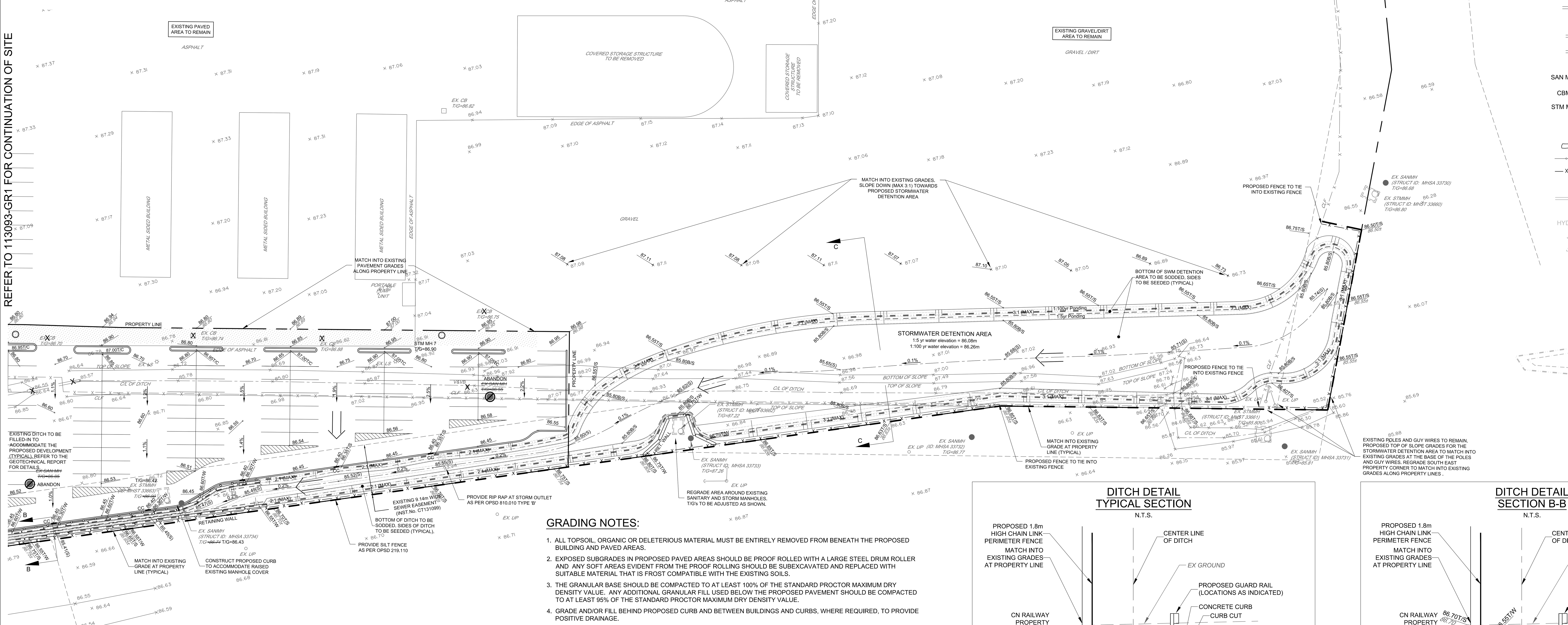
SHEET:

M:\2013\113093\CAD\Design\113093-GR.dwg, GR1, Jan 09, 2017 - 3:29pm, smatthews

Erosion and Sediment Control Responsibilities:

				During Construction			After Construction Prior to Final Acceptance		After Final Acceptance
	ESC Measure	Symbol	Specification	Installation Responsibility	Inspection/Maintenance Responsibility	Inspection Frequency	Approval to Remove	Removal Responsibility	Inspection/Maintenance Responsibility
Temporary Measures	Silt Fence	— · · —	OPSD 219.110	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Filter Fabric	Location as Indicated On Plans	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Rip-Rap	(rip-rap symbol)	OPSD 810.010 'B'	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Straw Bale Check Dam	(straw bale symbol)	OPSD 219.180	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Mud Mat	M M	Drawing Details	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Dust Control	Location as Required Around Site	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Stabilized Material Stockpiling	Location as Required by Contractor	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Sediment Basin (for flows being pumped out of excavations)	Location as Required by Contractor	- - -	Developer's Contractor	Developer's Contractor	After Every Rainstorm	Developer's Contractor	Developer's Contractor	N/A

REFER TO 113093-GR1 FOR CONTINUATION OF SITE



LEGEND

- 86.80 — PROPOSED ELEVATION
- 85.28(S) — PROPOSED SWALE ELEVATION
- 86.55(T/W) — PROPOSED TOP OF WALL ELEVATION
- 86.75(T/S) — PROPOSED TOP OF SLOPE ELEVATION
- 85.60(B/S) — PROPOSED BOTTOM OF SLOPE ELEVATION
- 86.92(T/C) — PROPOSED TOP OF CURB ELEVATION
- 88.40 — PROPOSED ELEVATION
- 86.68 — EXISTING ELEVATION
- 2.0% — GRADE AND DIRECTION
- MAXIMUM 3:1 SIDESLOPE
- DIRECTION OF MAJOR OVERLAND FLOW
- ℄ SWALE AND DIRECTION OF FLOW
- PROPOSED SILT FENCE
- PROPOSED CURB
- RIP-RAP PER OPSD 810.010 (TYPE 'B')
- DC — PROPOSED DEPRESSED CURB
- CC — PROPOSED 1.0m WIDE CURB CUT
- V&VB — PROPOSED VALVE & VALVE BOX
- SAN MH 1 — PROPOSED SANITARY MH
- CBMH 1 — PROPOSED CATCHBASIN MH
- STM MH 1 — PROPOSED STORM MH
- AD 1 — PROPOSED AREA DRAIN
- PROPOSED BUILDING ENTRANCE
- PROPOSED GABION BASKET RETAINING WALL
- PROPOSED GUARD RAIL
- PROPOSED 1.8m HIGH CHAIN LINK FENCE
- BENCHMARK LOCATION
- EXISTING CURB
- V&VB — EXISTING VALVE & VALVE BOX
- HYD — EXISTING HYDRANT C/W VALVE
- SAN MH — EXISTING SANITARY MH
- STM MH — EXISTING STORM MH
- CB — EXISTING CATCHBASIN
- CBMH — EXISTING CATCHBASIN MH
- LS — EXISTING LIGHT STANDARD
- EXISTING TREES
- REMOVALS
- MANHOLE TO BE ABANDONED AS PER SEWER NOTE #8
- APPROXIMATE PONDING LIMITS

APPROVED ☐ REFUSED ☐

THIS _____ DAY OF ___________, 20____

DON HERWEYER, MCIP, RPP, MANAGER
DEVELOPMENT REVIEW SOUTH
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

GRADING NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED BUILDING AND PAVED AREAS.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUBEXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS.
3. THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 100% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
4. GRADE AND/OR FILL BEHIND PROPOSED CURB AND BETWEEN BUILDINGS AND CURBS, WHERE REQUIRED, TO PROVIDE POSITIVE DRAINAGE.
5. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
6. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
7. ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).
8. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.
9. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING THE AS-BUILT ELEVATION OF EVERY DESIGN GRADE SHOWN ON THIS PLAN.

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $2,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ALL ORGANIC MATERIAL AND DEBRIS.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT No. PG3635-1 PREPARED BY PATERSON GROUP INC. FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION FOR ALL PARKING ACCESS\ ROADWAY ACCESS, PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
9. REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' No. R-2015-048 PREPARED BY NOVATECH.
10. REFER TO ARCHITECTS DRAWING FOR BUILDING AND HARD SURFACE AREAS AND DIMENSIONS.
11. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
12. PROVIDE LINE/PARKING PAINTING.

PAVEMENT STRUCTURES:

LIGHT DUTY PAVEMENT
50mm SUPERPAVE 12.5 (TRAFFIC LEVEL B)
150mm GRAN "A"
300mm GRAN "B" TYPE II
ASPHALT GRADE PG 58-34

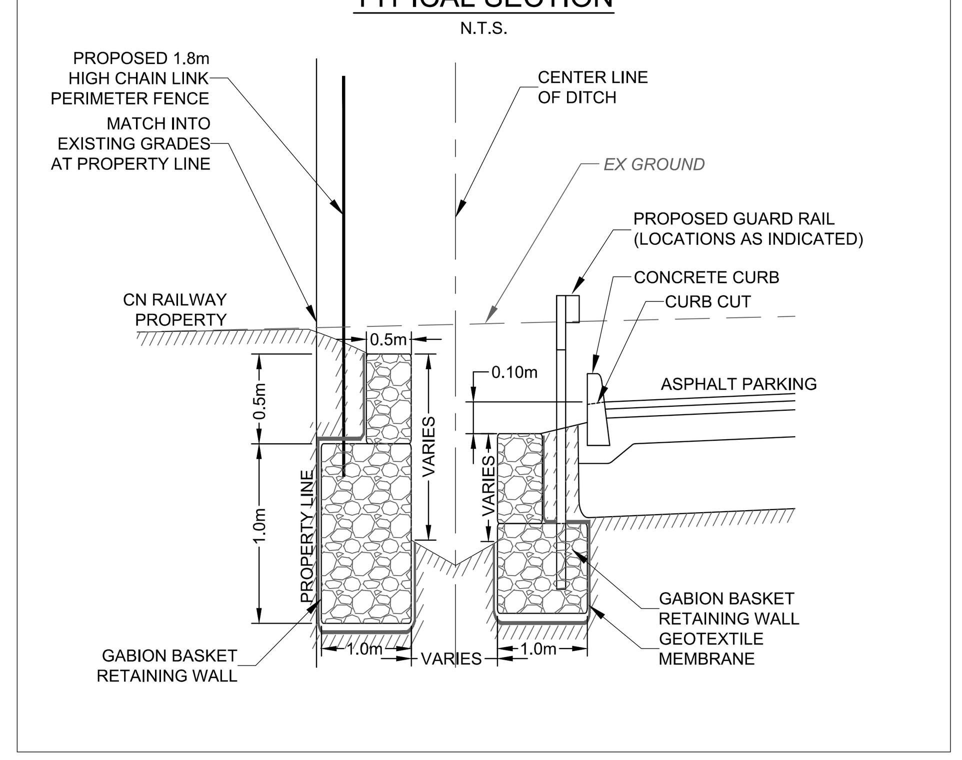
HEAVY DUTY NEW PAVEMENT
40mm SUPERPAVE 12.5 (TRAFFIC LEVEL B)
50mm SUPERPAVE 19.0 (TRAFFIC LEVEL B)
150mm GRAN "A"
450mm GRAN "B" TYPE II
ASPHALT GRADE PG 58-34

EROSION AND SEDIMENT CONTROL NOTES :

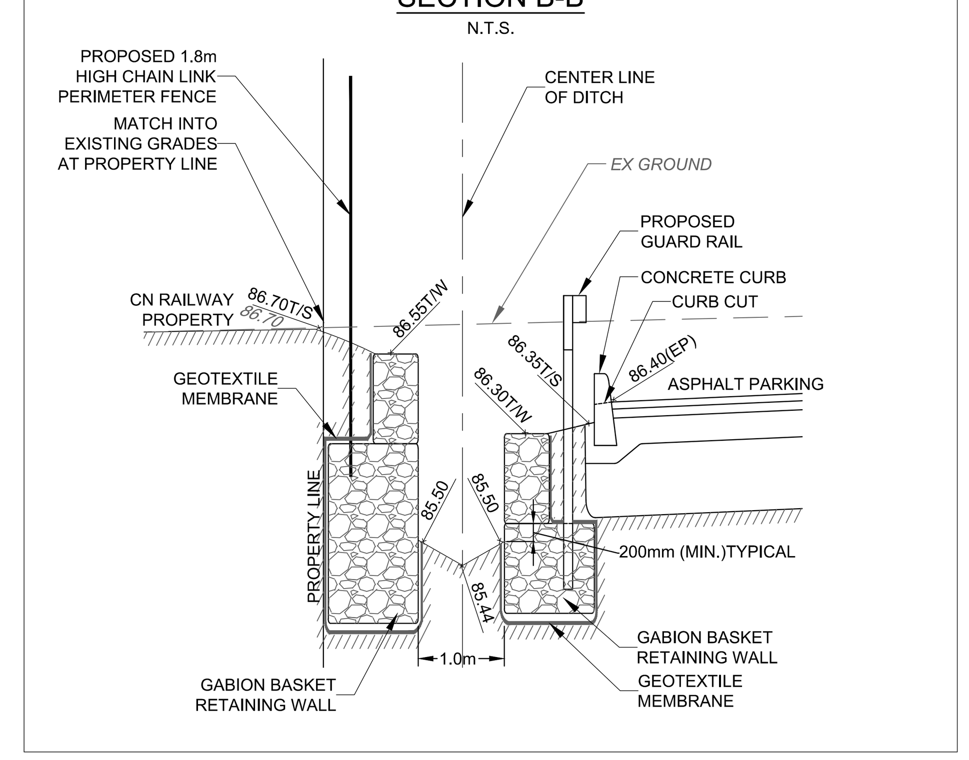
THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

1. ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED TO THE SATISFACTION OF THE ENGINEER AND THE CITY OF OTTAWA. THEY ARE TO BE APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION. THESE PRACTICES ARE TO BE IMPLEMENTED IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL AND SHOULD INCLUDE AS A MINIMUM THOSE MEASURES INDICATED ON THE PLAN.
2. EROSION AND SEDIMENT CONTROL MEASURES WILL BE IMPLEMENTED DURING CONSTRUCTION IN ACCORDANCE WITH THE "GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES" (GOVERNMENT OF ONTARIO, MAY 1987). THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEETING ALL REGULATORY AGENCY REQUIREMENTS.
3. TO PREVENT SURFACE EROSION FROM ENTERING ANY STORM SEWER SYSTEM DURING CONSTRUCTION, FILTER CLOTH WILL BE PLACED UNDER GRATES OF NEARBY CATCHBASINS AND STRUCTURES. A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED AROUND THE CONSTRUCTION AREA (WHERE APPLICABLE). THESE CONTROL MEASURES WILL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
4. TO LIMIT EROSION: MINIMIZE THE AMOUNT OF EXPOSED SOILS AT ANY GIVEN TIME, RE-VEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE AND PROTECT EXPOSED SLOPES WITH NATURAL OR SYNTHETIC MULCHES.
5. FOR MATERIAL STOCKPILING: MINIMIZE THE AMOUNT OF EXPOSED MATERIALS AT ANY GIVEN TIME; APPLY TEMPORARY SEEDING, TARPS, COMPACTION AND/OR SURFACE ROUGHENING AS REQUIRED TO STABILIZE STOCKPILED MATERIALS THAT WILL NOT BE USED WITHIN 14 DAYS.
6. THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE ENGINEER, THE MEASURES ARE NO LONGER REQUIRED. NO CONTROL MEASURES MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE ENGINEER.
7. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO ANY STORM SEWER SYSTEM. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
8. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
9. ROADWAYS ARE TO BE SWEPT AS REQUIRED OR AS DIRECTED BY THE ENGINEER AND/OR THE MUNICIPALITY.
10. THE CONTRACTOR SHALL ENSURE PROPER DUST CONTROL IS PROVIDED WITH THE APPLICATION OF WATER (AND IF REQUIRED, CALCIUM CHLORIDE) DURING DRY PERIODS. MONITOR DUST LEVELS DURING SITE PREPARATION/EXCAVATION, AND CONSTRUCTION ACTIVITIES, AND WHEN DUST LEVELS BECOME VISUALLY APPARENT SPRAY WATER TO MINIMIZE THE RELEASE OF DUST FROM GRAVEL, PAVED AREAS AND EXPOSED SOILS. USE CHEMICAL DUST SUPPRESSANTS ONLY WHERE NECESSARY ON PROBLEM AREAS.

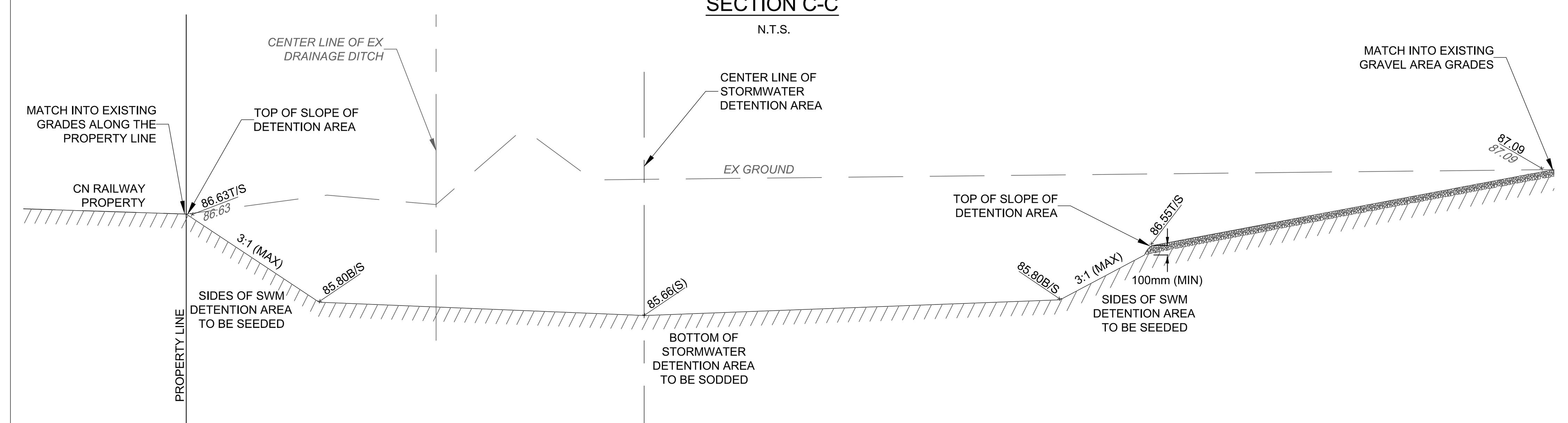
DITCH DETAIL TYPICAL SECTION
N.T.S.



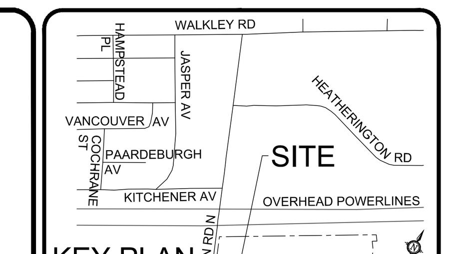
DITCH DETAIL SECTION B-B
N.T.S.



DITCH DETAIL SECTION C-C
N.T.S.



D07-12-16-0025



KEY PLAN
N.T.S.

The position of all pole lines, conduits, watermains, sewers and other underground and above ground utilities and structures is not necessarily shown on the contract drawings, and where shown, the accuracy of the position of such utilities and structures is not guaranteed. Before starting work, determine the exact location of all such utilities and structures and assume all liability for damage to them.

SITE BENCHMARK
REFERENCED TO LOCAL GEODETIC DATUM AS INDICATED ON DRAWING. SEE EXISTING VERTICAL CONTROL MONUMENT No.3453 (TABLET ON FOUNDATION) ON SOUTH-WEST CORNER OF BUILDING LOCATED AT 3091 ALBION ROAD NORTH.

OWNER INFORMATION
AHLUL-BAYT CENTRE OTTAWA (ABCO)
200 BARIBEAU STREET
OTTAWA, ONTARIO, K1L 7R6

AKRAM FARHAT
PHONE: (613) 526-0774
E-MAIL: akromi@gmail.com

JAMES B. LENNOX & ASSOCIATES INC.
LANDSCAPE ARCHITECTS
3332 CARLING AVE. OTTAWA, ONTARIO K2H 5A8
Tel. (613) 722-5168 Fax. 1(866) 343-3942

LICENSED PROFESSIONAL ENGINEER
F.S. THAUVETTE
100041399
JAN. 6, 2017
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

NO.	DATE:	REVISION:
2	JAN. 6, 2017	REVISED PER CITY COMMENTS
1	JAN. 27, 2016	ISSUED FOR SITE PLAN APPROVAL

SJL
S. J. LAWRENCE
ARCHITECT INCORPORATED
18 Deakin Street, Suite 205, Nepean, ON K2E 8B7
Tel: (613) 739-7770 Fax: (613) 739-7703
Email: sjl@sjlarchitect.com

DRAWN BY: SM	DESIGNED BY: SM / FST
DATE: JANUARY 2016	CHECKED BY: FST
SCALE: 1:400	PLOT DATE: JAN. 27, 2016

PROJECT:
AHLUL-BAYT CENTRE OTTAWA
3095 ALBION ROAD NORTH
OTTAWA, ONTARIO

NOVATECH JOB NO.: 113093-00

DRAWING NAME:
GRADING AND EROSION & SEDIMENT CONTROL PLAN

113093-GR2

SHEET: