Functional Servicing Report

Sean Homes
405 Essa Road
City of Barrie
County of Simcoe

PEARSON ENGINEERING

PEARSONENG.COM

(Revised January 2023)
October 2017
12089.02

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Functional Servicing Report
Sean Mason Homes – 405 Essa Road

1. Introduction

PEARSON Engineering Ltd. (Pearson) has been retained by Sean Homes (Client) to prepare a Functional Servicing Report (FSR) in support of the proposed residential development (Project) located at 405 Essa Road in the City of Barrie (City), County of Simcoe (County).

The Subject Project site is approximately 0.27 ha in area. The majority of the existing site drains to the northwest towards the existing City View SWM pond at the rear of the property. The concept for the Project is to construct an 8 storey condo building with townhouse units facing Essa Road and City View Circle with an underground parking facility. The location of the site can be seen in Figure 1.

This FSR assesses the existing municipal infrastructure in the vicinity of the Project, the onsite Stormwater Management (SWM) facilities, and internal services required to service the proposed Project. The report also includes design calculations and a brief outline of the proposed internal services, as well as comments regarding the ability of the various secondary utilities to service the site.

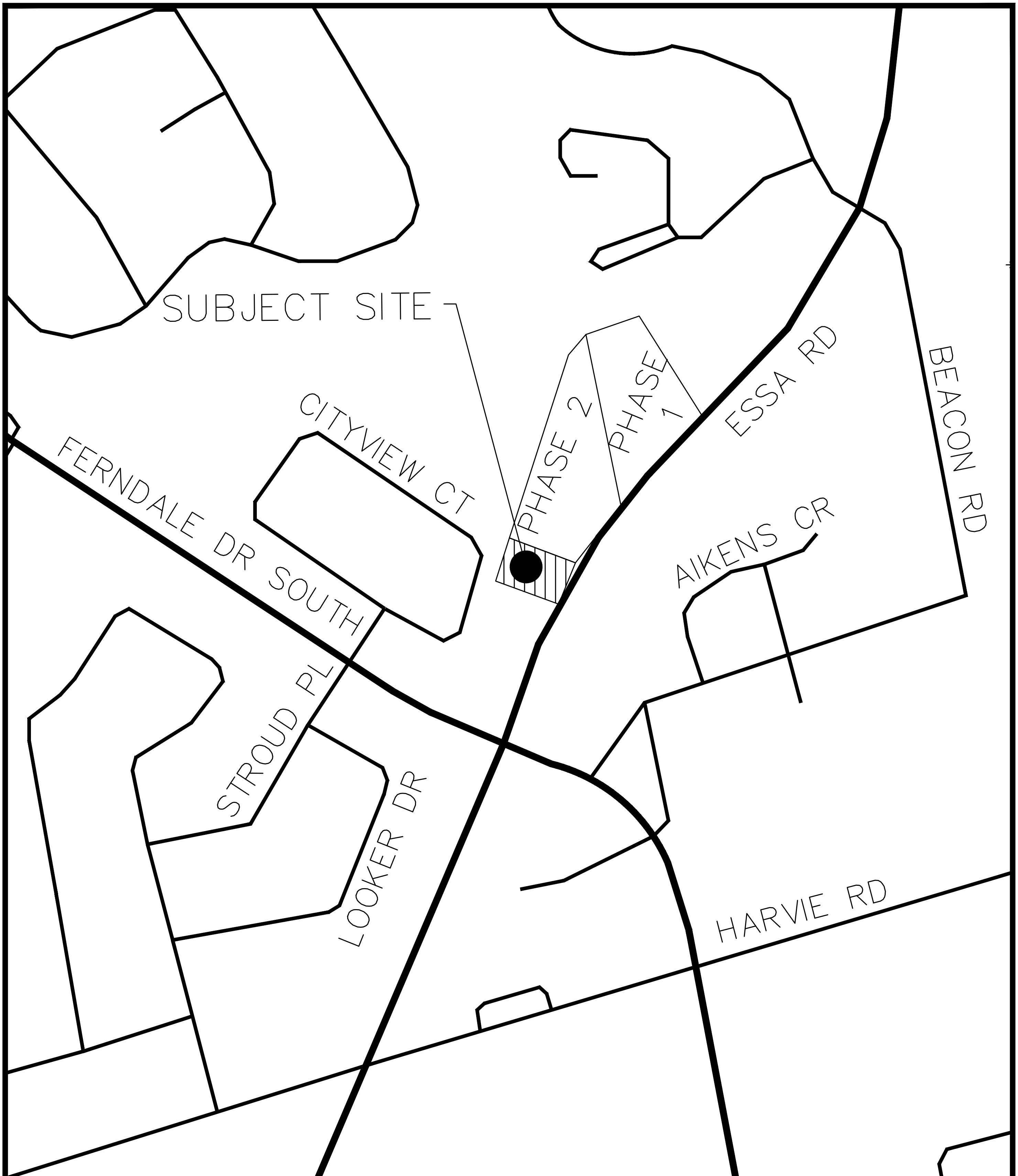
2. Supporting Documents

The following documents have been referenced in the preparation of this report:

- Ministry of the Environment, Design Guidelines for the Drinking-Water Systems, 2008.
- Ministry of the Environment, Design Guidelines for the Sewage Works, 2008.
- The Ministry of the Environment Stormwater Management Planning and Design Manual, March 2003.
- City of Barrie, Sanitary Sewage Collection System Policies and Design Guidelines – October 2017
- City of Barrie, Water Transmission and Distribution Design Standard – June 2022
- City of Barrie, Storm Drainage and Stormwater Management Policies and Design Guidelines – May 2022
- LSRCA Technical Guidelines for Stormwater Management – September 2016

3. Design Population

The proposed site is projected to have approximately 12 townhouse units and 83 apartment units. Using a population density of 2.34 people per unit for townhouses and 1.67 people per unit for apartments, the total site design population is approximately 167 people. Refer to Appendix A for calculations.



SEAN MASON HOMES
405 ESSA ROAD
CITY OF BARRIE

SITE LOCATION PLAN

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DESIGNED BY	GMP	HORIZ SCALE	N/A	PROJECT #	12089.02
DRAWN BY	NW	VERT SCALE	N/A	DRAWING #	FIG-1
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4. Water Supply and Distribution

4.1. Water Servicing Design Criteria

The site is to have a total population of 167 persons. Utilizing the City of Barrie guidelines for domestic water use of 350 L/capita/day, an Average Day Demand (ADD) of 0.68 L/sec is required. A Peak Rate factor of 7.40 is used in calculating the Peak Hour Demand of 5.00 L/sec for the development. Calculations for the domestic water requirements for the site can be found in Appendix A.

4.2. Internal Water Distribution System

The water system for this Project is intended for domestic and fire fighting use. There is an existing municipal 200 mm diameter watermain on the north side of Essa Road, along the front of the site, including fire hydrants within the vicinity of the project. A 100 mm diameter domestic watermain and 150 mm diameter fire watermain will each connect to the existing 200 mm diameter watermain on Essa Road and extend into the Phase 3 development in order to service the Project. Refer to Figure 2 for the domestic water service layout.

4.3. Fire Fighting Requirements

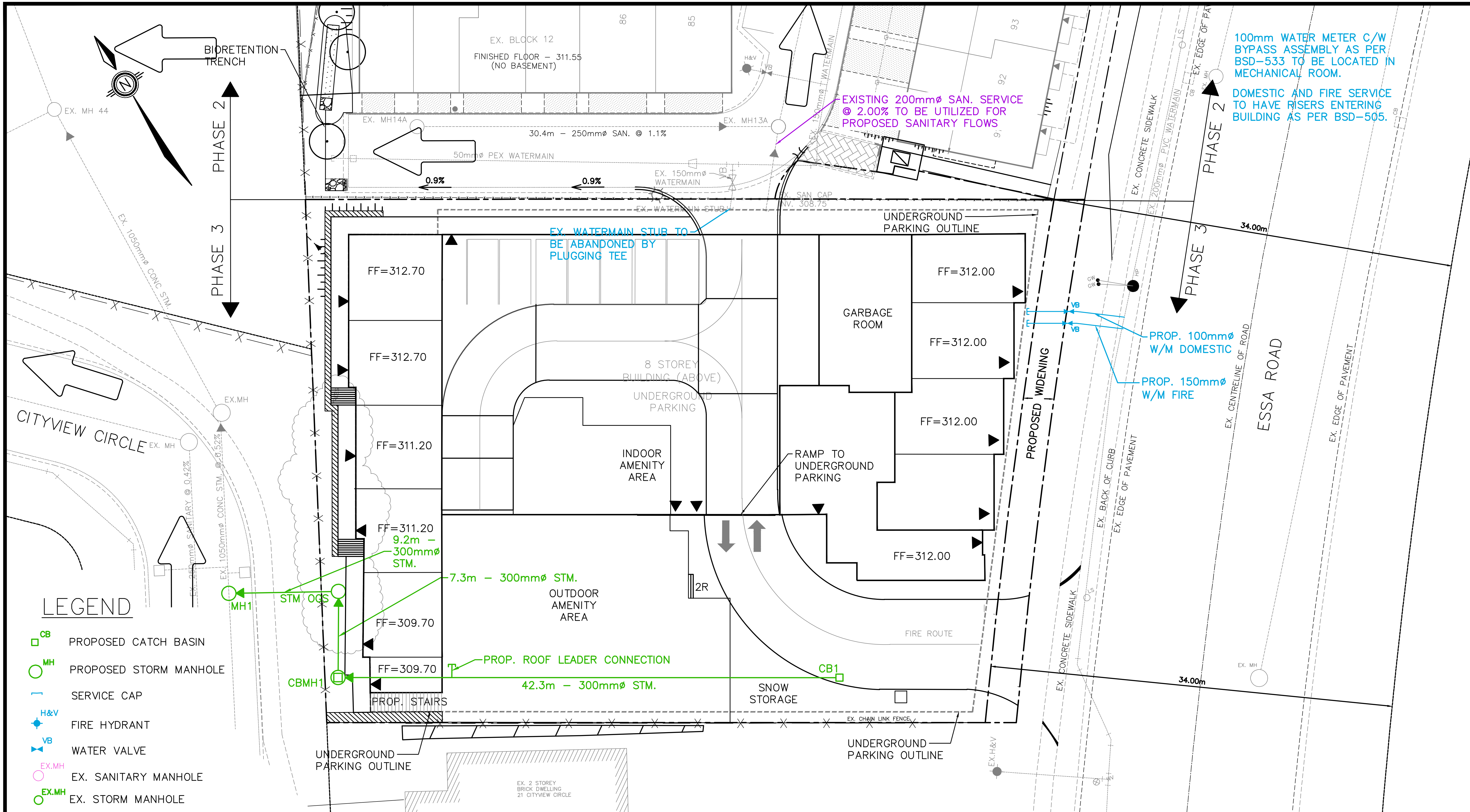
The Fire Underwriters Survey (FUS) assessment was used to calculate the required fire flow and was determined to be approximately 150 L/s (2,376 GPM). The building construction consists of a structure made of non-combustible exterior materials, a limited combustible contents factor, and a sprinklered water system. The building addition will be designed with fire sprinklers designed by a Sprinkler Designer to meet OBC requirements and connected to the existing building's sprinkler system. The effective floor area of the proposed building is 11,851 m^2. As per City of Barrie Standards, the minimum required fire flow is 200 L/s (3,170 GPM) for apartment buildings. The calculations mentioned above indicate that the required City of Barrie fire flow of 200 L/s (3,170 GPM) governs. Fire flow calculations are included in Appendix A.

Hydrant flow tests were completed by Vipond Inc. in two locations in April 2018 and September 2020 indicating that a static pressure of 53 psi and 50 psi was available on Essa Road. This test also resulted in a flow of 1,262 GPM at a residual pressure of 45 psi from the existing hydrant. Through extrapolation of the hydrant results, it was determined that a flow of 200 L/s (3,170 GPM) would result in a residual pressure of approximately 40.6 psi. Given that the hydrant on Burton Avenue can supply 200 L/s at a residual pressure of approximately 57 psi, the available fire flow meets both FUS and City of Barrie firefighting requirements. Refer to the fire flow calculations and information that can be found in Appendix A.

5. Sanitary Servicing

5.1. Sanitary Design Criteria

The site is to have a total population of 167 persons. Utilizing City of Barrie Guidelines for domestic sewer use of 350 L/capita/day, an Average Daily Flow (ADF) of 0.68 L/sec was calculated. Using a Peaking Factor of 4.0 for this project, a peak flow of 2.70 L/sec was calculated for the development. The proposed 200 mm diameter sanitary sewer has a capacity of 46.4 L/sec at 2.0% and is sufficient to convey the sanitary design flow to the existing municipal sanitary collection system on Essa Road. Sanitary design flow calculations can be found in Appendix B.



LEGEND

- PROPOSED CATCH BASIN (CB)
- PROPOSED STORM MANHOLE (MH)
- SERVICE CAP
- FIRE HYDRANT (H&V)
- WATER VALVE (VB)
- EX. SANITARY MANHOLE (EX.MH)
- EX. STORM MANHOLE (EX.MH)
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- 255.92 PROPOSED ELEVATION
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- 1.5% PROPOSED DIRECTION AND GRADE
- ▼ DOOR LOCATION
- PROPOSED CONCRETE BARRIER CURB (OPSD 600.110)
- PROPOSED ROLLOVER CURB AND GUTTER (OPSD 600.100)

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FIGURE 2 – SITE SERVICING

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DESIGNED BY	PG/MWD	HORIZ SCALE	1:300	PROJECT #	12089.02
DRAWN BY	PG	VERT SCALE		DRAWING #	FIG–2
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5.2. Internal Sanitary Sewer System

The Project's sanitary sewer system will convey flow via a 200 mm gravity sanitary sewer from the site and connect to existing MH13A located in the Phase 2 development northeast of the site. The sanitary sewer system will connect at the north side of the proposed building and will convey flow to the existing 200 mm diameter sanitary stub that was previously designed and installed at a grade of 2.0%. The sanitary system ultimately drains to Essa Road through the Phase 2 site. The proposed sanitary sewer system for the site can be seen on Figure 2.

5.3. Downstream Sanitary Analysis

As discussed in the previous sections, the project site will generate a peak flow of 2.70 L/s and will ultimately outlet into the municipal sanitary sewer system at manhole SAB05109 located on the south side of Essa Road. City of Barrie sanitary sewer sheets show that the existing 250 mm diameter sanitary sewer has a capacity of 72.85 L/s at 1.50% at the location of the manhole. A downstream analysis was completed using City of Barrie as builts, which demonstrate that the maximum percent full in the existing sewer after adding the Project's flows is 42%, and therefore has sufficient capacity for the development. Sanitary sewer design sheets can be seen in Appendix B.

6. Stormwater Management

A key component of the Development is the need to address environmental and related Stormwater Management issues. These are examined in a framework aimed at meeting the City of Barrie, Lake Simcoe Region Conservation Authority (LSRCA) and MECP requirements. This FSR focuses on the necessary measures to satisfy the approval agency's SWM requirements.

It is understood the objectives of the SWM plan are to:

- Protect life and property from flooding and erosion;
- Maintain and protect significant natural features;
- Maintain water quality for ecological integrity, recreational opportunities etc.;
- Protect aquatic and fishery communities and habitats;
- Protect and maintain groundwater flow regime(s).

6.1. Analysis Methodology

The design of the SWM Facilities for this site has been conducted in accordance with:

- The Ministry of the Environment Stormwater Management Planning and Design Manual, March 2003
- City of Barrie, Storm Drainage and Stormwater Management Policies and Design Guidelines – May 2022
- Lake Simcoe Region Conversation Authority Technical Guidelines for Stormwater Management Submissions – September 2016

In order to design the facilities to meet these requirements, it is essential to select the appropriate modeling methodology for the storm system design. Given the size of the site and the number of catchment areas, the Modified Rational Method is appropriate for the design for the SWM system.

6.2. City View Stormwater Management Pond

A Stormwater Management Report was completed in February, 1991 by R.G. Robinson and Associates LTD, which addresses the stormwater management of the existing City View Developments located west of the Project site at the intersection of Essa Road and Harvie Road. The City View subdivision is approximately 32 hectares in size and both the minor and major system is directed to an existing 12,000 m^3 Stormwater Management Facility (City View SWM Pond) located immediately north of the site. The storm catchment plan for the existing SWM Pond has been included in Appendix C.

As part of the design of the neighboring Sean Homes Phase 2 site, Pearson Engineering recreated the pre-development model with the computer software Visual OTTHYMO using the MICROHYMO output tables from the R.G. Robinson report. The recreated model, which included the 405 Essa Road property at an imperviousness of 60%, was then run using the updated City of Barrie 2010 storm distributions. The results from the model concluded that the existing SWM Pond had sufficient capacity for the Sean Homes Ph. 2 development with minor modifications to the outlet structure. For more detailed information regarding the City View SWM Pond, please refer to the Amended City View SWM Pond Report by Pearson Engineering, dated February 2017.

6.3. Existing Conditions

The site currently consists of a residential lot with the majority of the site generally sloping from the south toward the north at 3.5% grade. A portion of the site on the southeast side of the lot drains toward Essa Road at an average grade of approximately 2.0%.

According to the Geotechnical Investigation completed by Terraprobe in September 2015 for the Phase 2 site, the subject property is comprised of sandy fill, native sand deposits and silty sand glacial till soils. These characteristics indicate the soil is part of the Hydrologic Soil Group A. Piezometers were installed in six borehole locations which determined that the groundwater level was 6.3 m below existing ground. Pre development peak flows obtained from the original City View SWM Pond Report can be seen below in Table 1.

Table 1: Pre-Development Peak Flows (R. G. Robinson)

	2 Year Storm	5 Year Storm	25 Year Storm	100 Year Storm
Area Draining to Whiskey Creek (Westerly to Essa Road) Chicago Storm Peak Flow (m^3/s)	0.03	0.08	0.13	0.18
Area Draining to Whiskey Creek (Westerly to Essa Road) 24 Hour SCS Storm Peak Flow (m^3/s)	0.06	0.11	0.19	0.26
Area Draining to Bear Creek (Northerly to City View SWM Pond) 4 Hour Chicago Storm Peak Flow (m^3/s)	0.17	0.27	0.54	0.81
Area Draining to Bear Creek (Northerly to City View SWM Pond) 24 Hour SCS Storm Peak Flow (m^3/s)	0.21	0.32	0.49	0.97

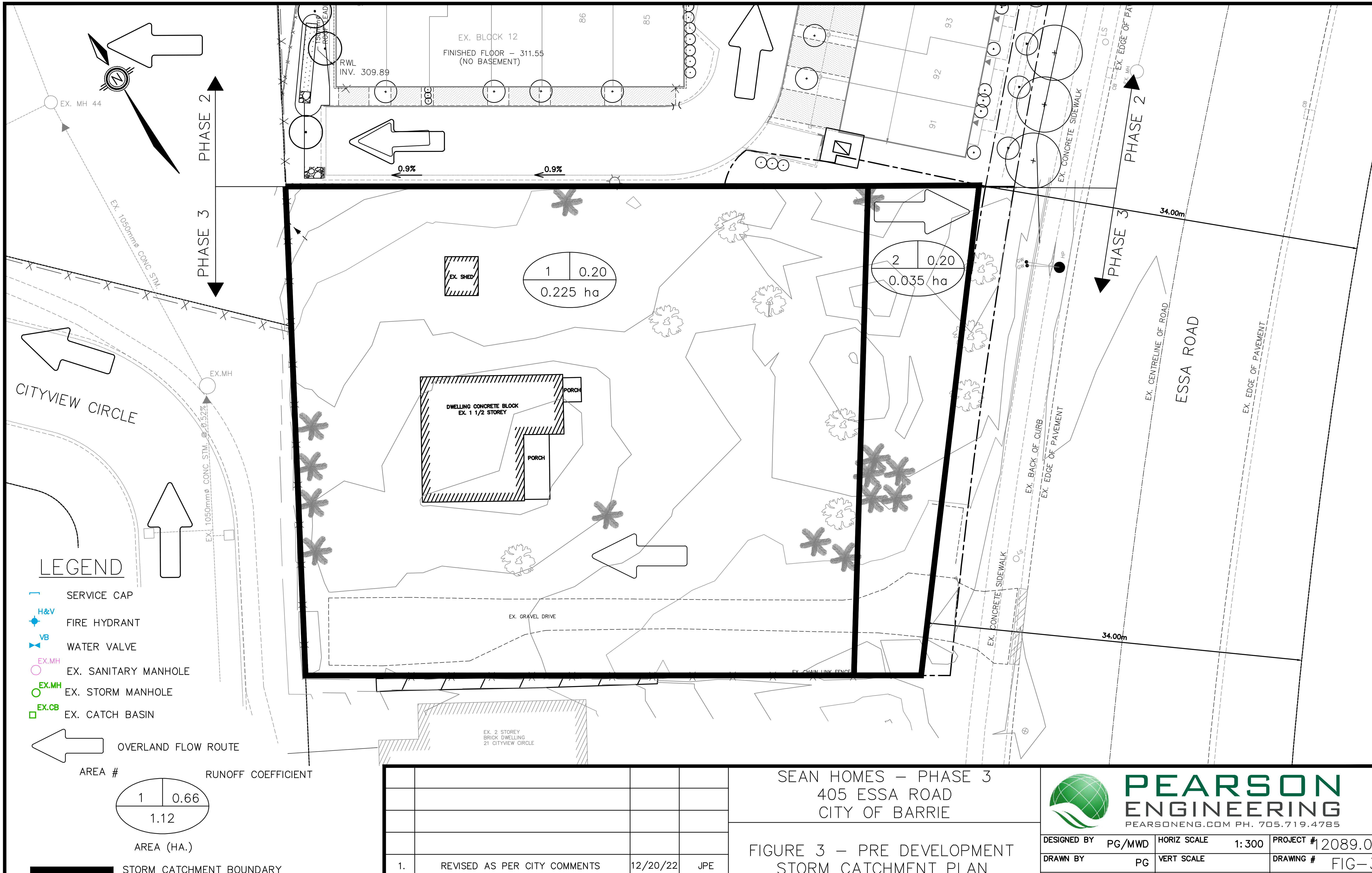

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FIGURE 3 – PRE DEVELOPMENT
STORM CATCHMENT PLAN

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6.4. Proposed Storm Drainage System

The post development drainage will generally follow pre-development conditions. The majority of the site is roof area with a driveway off Essa Road and a small landscaped area. A catchbasin and storm sewer system will capture all storm flows up to the 5-year storm. The storm sewer will convey stormwater through an Oil/Grit Separator (OGS) unit prior to outletting to the City View storm sewer on City View Circle and ultimately drain to the existing City View SWM pond.

In the event of a storm greater than the 5 year storm, the storm sewer will surcharge and the majority of the major system flows will be conveyed by overland flow to City View Circle to the downstream SWM Pond. A portion of the major system flows from the proposed driveway as well as a small portion of the site fronting Essa Road will be conveyed uncontrolled easterly to Essa Road. The proposed storm drainage patterns for the site can be seen on Figure 4.

6.4.1. Stormwater Quantity Control

The proposed development will increase the imperviousness of the site and as such the post-development peak flows will increase. Therefore, quantity controls will be required in order to attenuate the increase in stormwater runoff from the Project site.

Quantity control will be provided through the existing City View SWM Pond located northwest of the site. As part of the design for the Phase 2 site, the pond was analysed for an area from the 405 Essa Road site of approximately 9,814 m^2 and an imperviousness of 61%. After revising the storm catchment plan for the Project, the drainage area from the Project has been increased to 9,923 m^2 at an imperviousness of 62%. As this increase is considered nominal, no further modifications to the City View SWM Pond are expected to be required to accommodate the site. The post development peak flows for the City View SWM Pond are summarized below in Table 2, and detailed modeling results can be seen in Appendix H.

Table 2: Post-Development Peak Flows (Sean Mason – Phase 2)

	2 Year Storm	5 Year Storm	10 Year Storm	25 Year Storm	50 Year Storm	100 Year Storm	Regional Storm
Area Draining to Whiskey Creek 4 Hour Chicago Storm Peak Flow (m^3/s)	0.04	0.08	0.10	0.14	0.17	0.20	
Area Draining to Whiskey Creek 24 Hour SCS Storm Peak Flow (m^3/s)	0.08	0.14	0.18	0.24	0.29	0.34	0.22
Area Draining to Bear Creek 4 Hour Chicago Storm Peak Flow (m^3/s)	0.15	0.22	0.30	0.44	0.55	0.68	
Area Draining to Bear Creek 24 Hour SCS Storm Peak Flow (m^3/s)	0.23	0.35	0.44	0.56	0.69	0.95	3.02

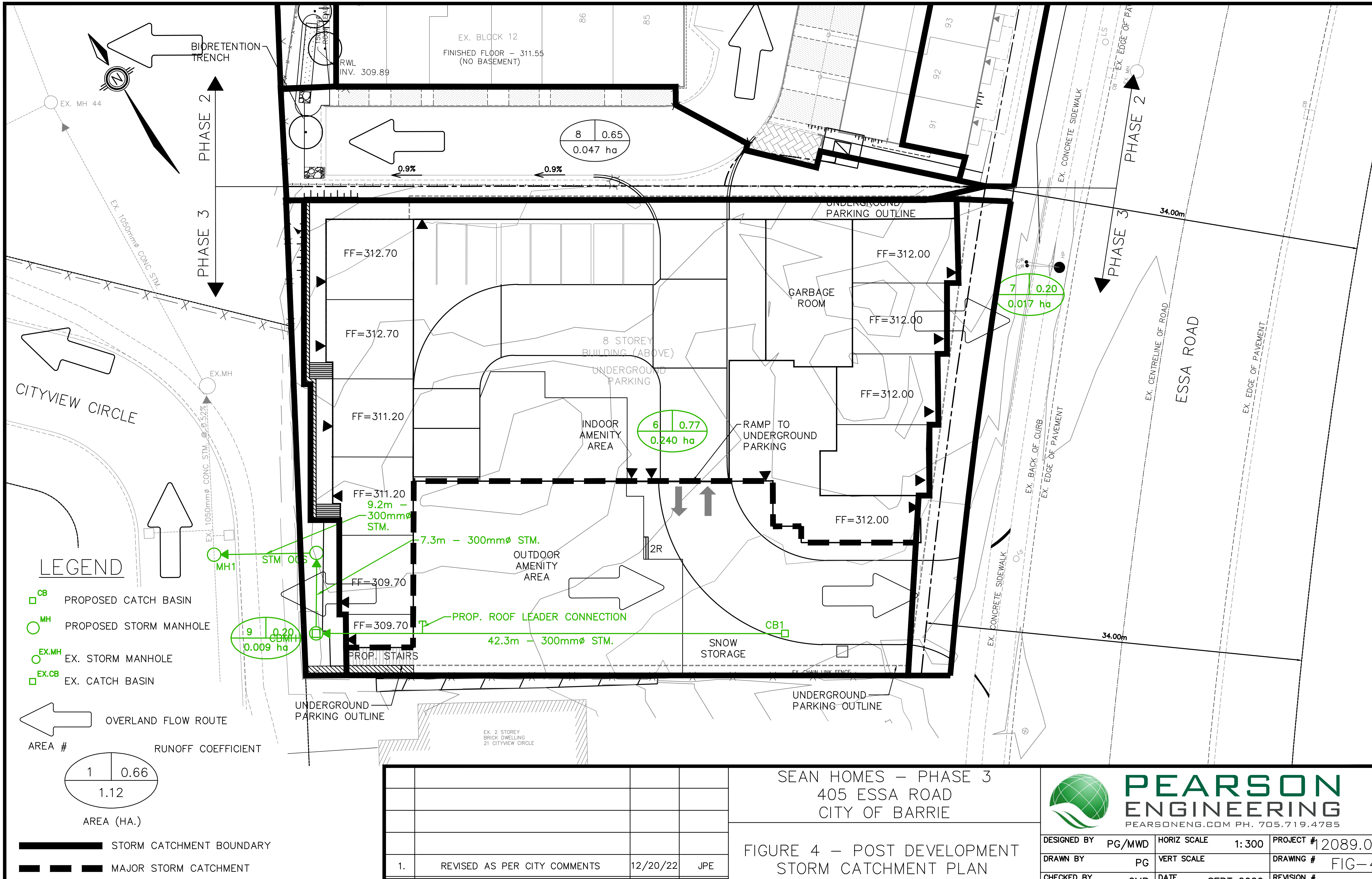

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FIGURE 4 – POST DEVELOPMENT STORM CATCHMENT PLAN

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P:\Autodesk Vault\Working Folders\12089.02 – Sean Mason, Ph.3\Engineering\12089.02 – BASE – PHASE 3_rev2.dwg Layout:FIG-4 Plotted Jan 27, 2023 @ 12:02pm by jevans @ PEARSON ENGINEERING LTD.

6.4.2. Volume Control

Since the project site meets the definition of Major Development as per LSRCA Guidelines, considerations were taken to meet the volume control criteria detailed in Section 2.2.2. The LSRCA guidelines state that for a new development that creates 500 m^2 or more of impervious surfaces, 25 mm of runoff over the total impervious area of the site is to be retained and treated on site, with flexible alternatives if this criterion cannot be met.

Using the preferred criteria of 25 mm over the site's impervious area a storage volume of 58 m^3 would be required. Mitigation options to achieve the required volume reduction were considered such as infiltration galleries, permeable pavers, and bioretention trenches. These treatment options typically must be installed in native ground and require a depth ranging from 0.50 m to 1.5 m. Sufficient depth cannot be achieved below the parking lot as the concrete slab for the underground parking structure is located near the surface. As the underground parking for the project is located below approximately 95% of the footprint of the site, no volume control measures are feasible.

6.4.3. Permanent Quality Control

The Project's active roadway and parking facilities pose a risk to stormwater quality through the collection of grit, salt, sand and oils on the paved surfaces. Prior to entering the dry pond, stormwater within the storm sewer system will flow through an OGS unit to treat the storm water released from this site to the MECP's Enhanced Level Protection standard. This MECP standard stipulates a Total Suspended Solids (TSS) removal of at least 80%. Regular inspections and proper maintenance of the proposed OGS unit will ensure the TSS removal rate will be achieved as well as protect the downstream watercourse from oil, grease, and heavy metals. The OGS unit is to be located outside the underground parking garage adjacent to City View Circle right of way and will be accessed from City View Circle for maintenance purposes.

6.4.4. Quality Control during Construction

During construction, earth grading and excavation will create the potential for soil erosion and sedimentation. It is imperative that effective environmental and sedimentation controls are in place and maintained throughout the duration of construction activities to ensure the stormwater runoff's quality. Therefore, the following recommendations shall be implemented and maintained during construction to achieve acceptable stormwater runoff quality:

- Installation of filter strips, silt fences and rock check dams or other similar facilities throughout the site, and specifically during all construction activities, in order to reduce stormwater drainage velocities and trap sediment on-site; and,
- Restoration of exposed surfaces with vegetative and non-vegetative material as soon as construction schedules permit, the duration of which is not to exceed 30 days;
- Provision of a mud-mat where applicable at the construction entrances in order to control the tracking of sediment and debris onto municipal streets.

6.5. Phosphorus

Local conservation authorities have determined the importance of reducing phosphorus levels in water courses in this area. The reduction was based on conservative values derived from the LSRCA. As such, best efforts are to be employed in order to reduce phosphorus levels to pre-development levels or better.

The existing site generates approximately 0.04 kg of phosphorus annually and the proposed Project will generate approximately 0.37 kg of phosphorus annually if uncontrolled. The site will produce more phosphorus than can be reduced using various quality control measures. As such, best efforts will be used in order to reduce the phosphorus loading as much as is reasonably possible.

Due to the layout of the underground parking covering almost the entire site, LID features such as rooftop infiltration and bioretention trenches cannot be effectively implemented. The majority of the runoff from the proposed site will be conveyed to the existing City View SWM pond. Based on LSRCA guidelines, the existing dry pond will provide a 10% reduction in phosphorous.

The following chart details the anticipated phosphorus loadings for the pre and post-development conditions.

Table 3: Phosphorus Loadings

	Total P (kg)
Pre-Development	0.04
Uncontrolled Post-Development	0.37
Controlled Post-Development	0.33

Detailed calculations can be found in Appendix D.

6.5.1. Phosphorus Offsetting Policy

The LSRCA has implemented a Phosphorus Offsetting Policy in July 2021 which has a goal that all new development must reduce 100% of the phosphorus leaving the property. A fee of $35,770/kg/year and an administration fee of 15% is required for anything above a net 0 kg of phosphorus leaving the site. Therefore, the required fee for the proposed development is as follows:

LSPOP Fee = $35,770 x 2.5 x 0.33 kg + 15% Administration fee = $33,534

6.6. Water Balance

Since the post-development state will increase the imperviousness of the site, considerations were taken in regards to groundwater recharge. A water budget was completed as per LSRCA guidelines, and under pre-development conditions the project site had an annual recharge volume of 618 m^3. With the increased imperviousness of the site, this recharge will be reduced to 200 m^3, resulting in a deficit volume of 418 m^3.

As previously discussed, the underground parking for the project is located below approximately 95% of the footprint of the site and therefore sufficient space for infiltration facilities is not available. Detailed water balance calculations have been provided in Appendix E.

6.6.1. Water Balance Recharge Offsetting Policy

The LSRCA has implemented a Water Balance Recharge Offsetting Policy in July 2021 in which off-site compensation may be achieved by preferring that the compensating facility be constructed prior to the subject development causing the recharge deficit and thereby allowing LSRCA to implement LID to make up the difference. Therefore, the required fee calculated for the proposed development is as follows:

LSPOP Fee = 418 x 44.88 + 15% Administration fee = $21,574

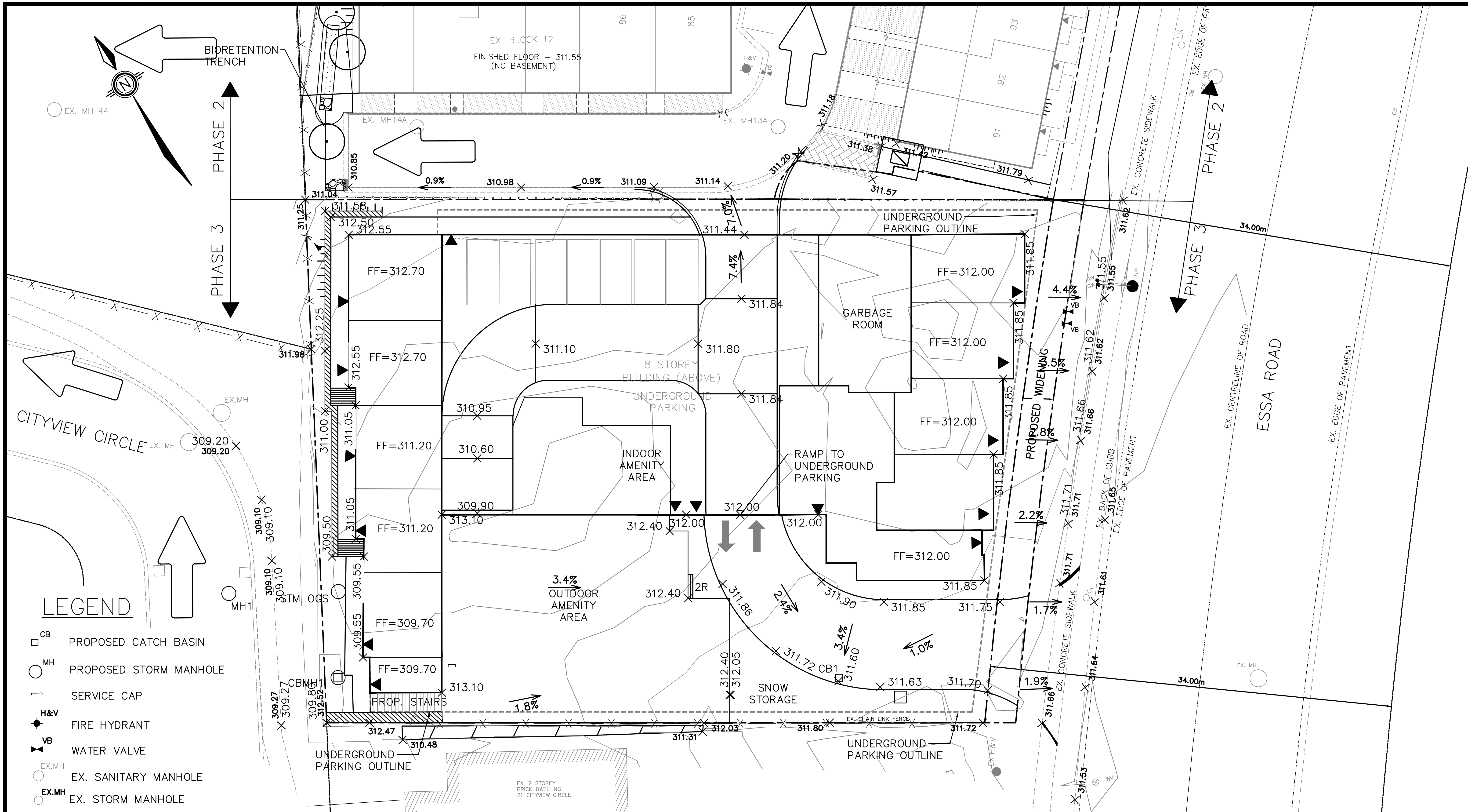
Refer to Appendix E for detailed water balance compensation calculations.

7. Grading

A grading design has been completed for the project to confirm drainage of the site. The grading has been designed to generally flow to the southern portion of the property, allowing the water to be collected by the proposed storm sewer system. The east portion of the proposed building will drain uncontrolled to Essa Road. The portion of the site west of the townhouse units will flow uncontrolled west to Cityview Circle. Refer to Figure 5 for details regarding the grading design.

8. Letters to Utilities

Letters have been sent to all secondary utilities to notify them of the proposed development, confirm information on the availability of their services for the site and ensure they are able to adequately support the proposed development. Copies of these letters have been included in Appendix F.



LEGEND

- PROPOSED CATCH BASIN (CB)
- PROPOSED STORM MANHOLE (MH)
- SERVICE CAP
- FIRE HYDRANT (H&V)
- WATER VALVE (VB)
- EX. SANITARY MANHOLE (EX.MH)
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- EX. CATCH BASIN (EX.CB)
- 255.92 PROPOSED ELEVATION
- 255.92 EXISTING ELEVATION
- 1.5% PROPOSED DIRECTION AND GRADE
- DOOR LOCATION
- PROPOSED CONCRETE BARRIER CURB (OPSD 600.110)
- PROPOSED ROLLOVER CURB AND GUTTER (OPSD 600.100)

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FIGURE 5 – SITE GRADING

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9. Conclusions

The proposed development will require the connection of sanitary services to the existing municipal services in Phase 2. The services for Phase 1 and Phase 2 have been installed and are operational, therefore no issues are expected with this approach. The proposed water service connections for domestic and fire will be made to the existing municipal watermain on Essa Road.

The post development storm drainage for the site generally follows current drainage patterns. Similar to the design of the Phase 2 site, Quantity control for the project will be provided by the existing City View SWM Pond located northwest of the development to reduce post-development peak flows to pre-development values.

The existing Stormwater Management Pond will be utilized to provide quantity control and to reduce the phosphorous loading of the proposed site.

The analysis and conceptual designs outlined in this report demonstrates that the servicing is feasible.

All of which is respectfully submitted,
PEARSON ENGINEERING LTD.

Taylor Arkell, P.Eng.
Senior Project Manager

Mike Dejean, P.Eng.
Manager of Engineering Services

Appendix A

Water Servicing Calculations

Sean Homes - Phase 3
Water Flow Calculations

Design Criteria

Demand per capita (Q):	350	L/cap/day
Peak Rate Factor (Max. Hour	7.4	(Table 3-3: Peaking Factors, MOE Design Guidelines for Drinking-Water Syste
Max. Day Factor	4.9	(Table 3-3: Peaking Factors, MOE Design Guidelines for Drinking-Water Syste

Site Data

Description	Density		Units		Flow Rate		Peaking Factors*	
Townhomes	2.34	person/unit	12	units	350	L/cap/d	MAX DAY FACTOR	4.90
Apartments	1.67	person/unit	83	units	350	L/cap/d	PEAK RATE FACTOR	7.40
							*From MOE Manual Table 3.1	

Calculate Population

Pop.	=	2.34	x	12	+	1.67	x	83
Pop.	=	167	people					

Calculate Average Day Demand

ADD	=	350	x	166.69
ADD	=	58342	L/day	
ADD	=	0.68	L/s	

Calculate Max Day Flow

MDF	=	0.68	x	4.90
MDF	=	3.31	L/s	

Calculate Peak Hour Demand

PHD	=	0.68	x	7.40
PHD	=	5.00	L/s	

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Sean Homes - Phase 3
Fire Flow Calculations

Required fire flow calculations as per the Fire Underwriters Survey's Water Supply for Public Fire Protection (DRAFT) - 2019:

Location:	699 Veterans Dr., Barrie	
OBC Occupancy	Residential	
Building Foot Print:	1,481 m^2	
# of Stories:	8	**Stories**

Date: 2023-01-27
Project: Sean Homes
Project Number: 12089.02

Type	Construction Class	Charge
5	Wood Frame	1.5
4	Heavy Timber	0.9
3	Ordinary	1.0
2	Non-Combustible	0.8
1	Fire Resistive	0.6

Construction Class: Type 2 | Non- Combustible

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

Automated Sprinkler Protection:		Credit	Total
NFPA 13 sprinkler standard	Yes	30%	50%
Standard Water Supply	Yes	10%	
Fully Supervised System	Yes	10%	

Contents Factor: Limited Combustible **Charge:** -15%

Exposure Side & Building	Length - Height Ratio	Distance to Exposure Building (m)	Charge
North Ex. Detached Home	> 100	26.9	0%
East Ex. Townhouse	> 100	5.6	4%
South Ex. Detached Home	> 100	> 30.1	0%
West Ex. Detached Home	> 100	5.1	4%
		Total:	**8%**

Separation Distance	Charge
0.0 - 3.0 m	15%
3.1 - 10.0 m	11%
10.1 - 20.0 m	8%
20.1 - 30.0 m	4%
> 30.1 m	0%

Are Buildings Contigious? No

Fire Resistant Building: Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?

Calculations: *C* = 0.8 Non-Combustible

Required Fire Flow ***RFF = 220 x C x √A***

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

Total Effective Area *A* = 11,851 m²

RFF = 19,160 L/min

Round to Nearest 1000 L/min RFF = 19,000 L/min * Must be > 2,000 L/min or < 45,000 L/min

Correction Factors:

Contents Charge		-2,850	L/min
RFF Adjusted for Contents	**E =**	16,150	L/min
Reduction For Sprinkler	**F =**	8,075	L/min
RFF w/ Sprinkler Reduction		8,075	L/min
Exposure Charge	**G =**	1,292	L/min
RFF w/ Exposure Charge		9,367	L/min

As per "Water Supply for Public Fire Protection" pg.20 note H:
***RFF* = E - F + G**

RFF = 16150 L/min - 8075 L/min + 1292 L/min
RFF = 9367 L/min

Required Fire Flow: **RFF =** 9,367 L/min

Round to Nearest 1000 L/min **RFF = 9,000 L/min**

RFF= 2,376 GPM

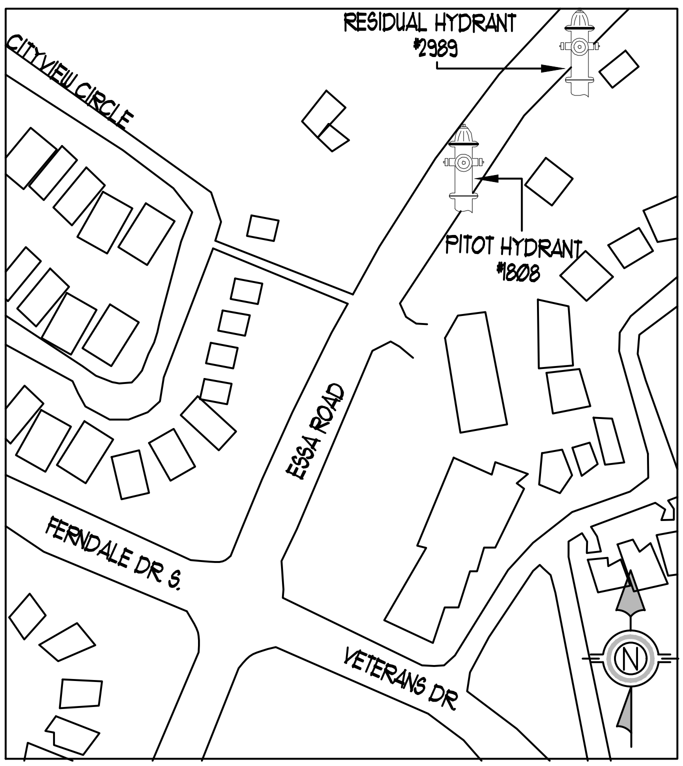
RFF = 150 L/s

FLOW TEST RESULTS

DATE : APRIL 11, 2018 TIME : 11:30 AM

LOCATION : 390 ESSA ROAD
BARRIE, ONTARIO

TEST BY : VIPOND FIRE PROTECTION AND LOCAL PUC



STATIC PRESSURE : 53 PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S. GPM)
1	1	2-1/2"	0.9	50	38	1034
2	2	2-1/2"	0.9	49	24	1644

FIRST FOR FIRE, LIFE SAFETY & SECURITY

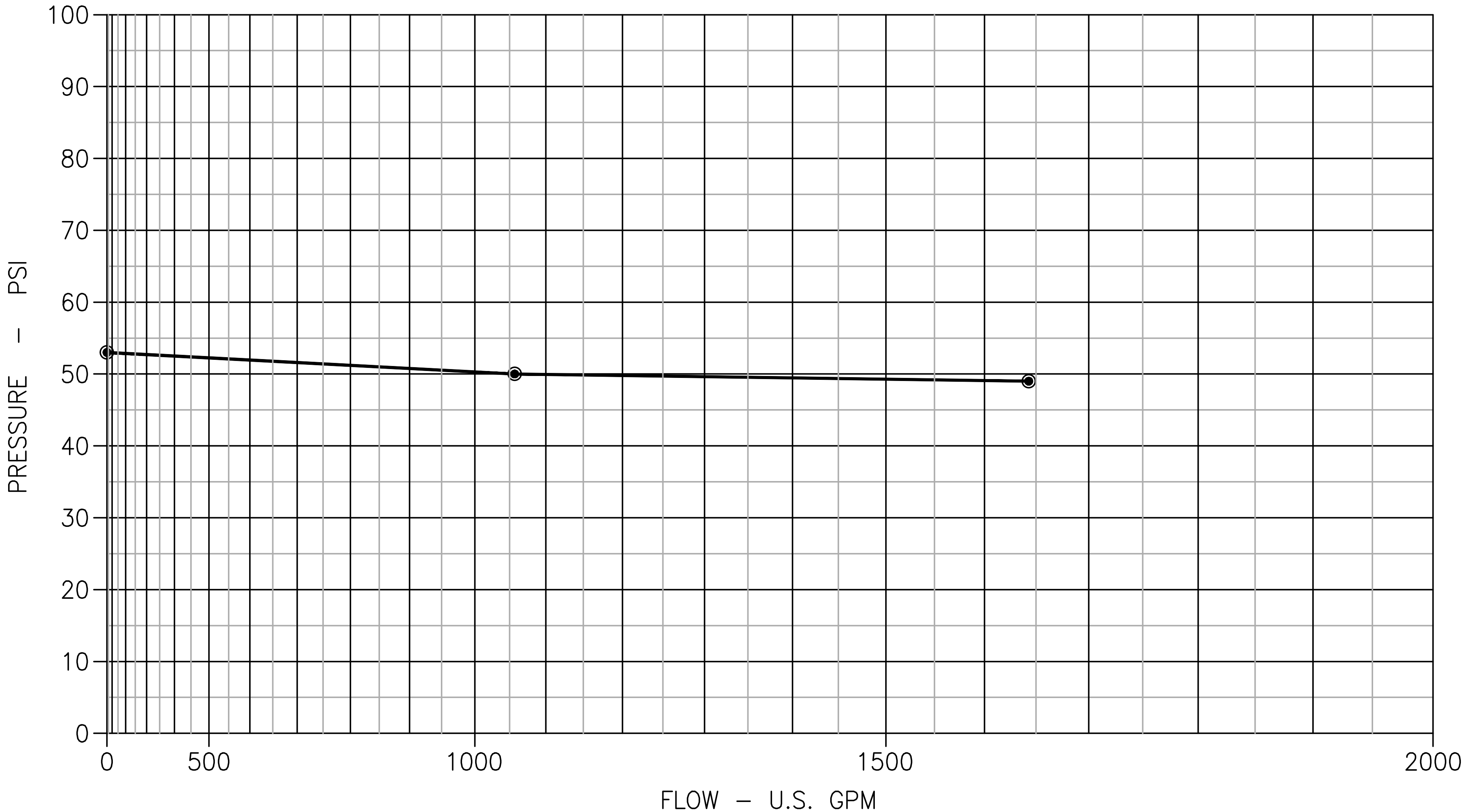
VIPOND INC

est. 1945

390 ESSA ROAD	
BARRIE, ONTARIO	

BY :	MIKE POWELL
VIPOND OFFICE :	BARRIE
TEST BY :	VIPOND & PUC
DATE :	APRIL 11 2018

STATIC:		RESIDUAL:		FLOW:
53 PSI	TEST#1	50 PSI	@	1034 GPM
	TEST#2	49 PSI	@	1644 GPM

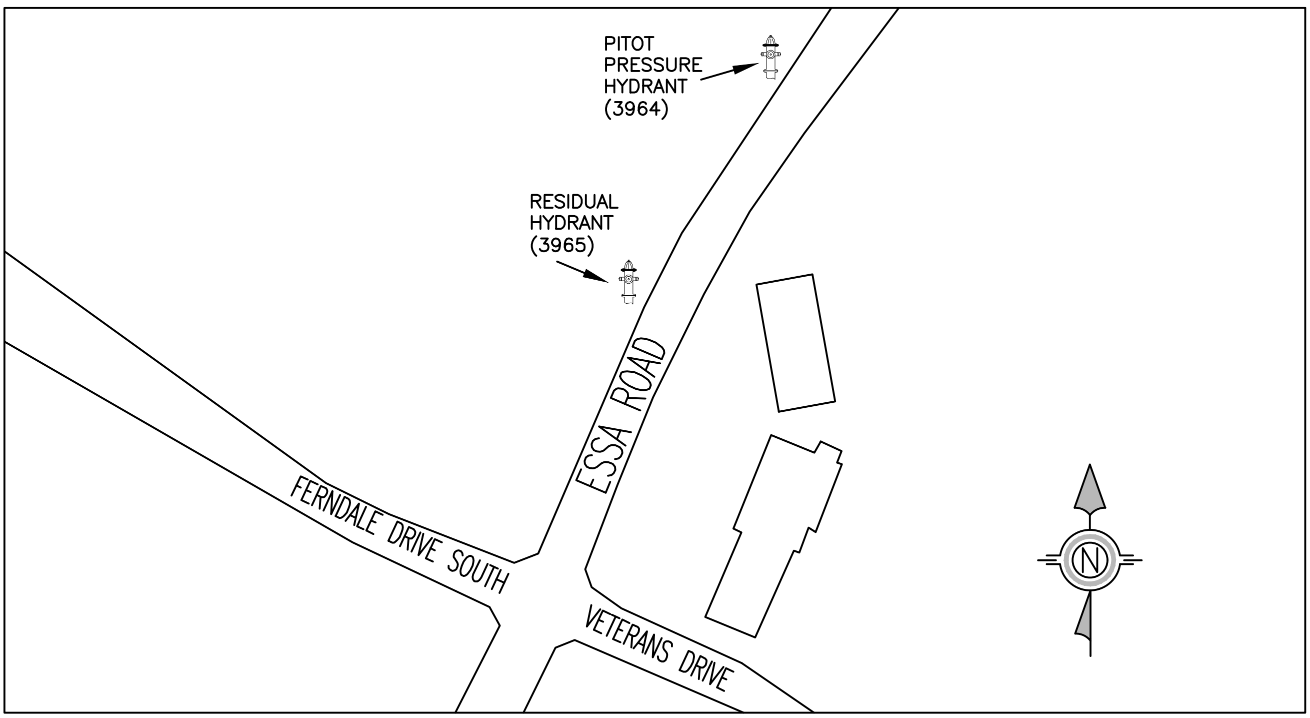


FLOW TEST RESULTS

DATE : TUESDAY SEPTEMBER 22, 2020 TIME : 2:30 PM

LOCATION : 440 ESSA ROAD
BARRIE
ONTARIO

TEST BY : VIPOND FIRE PROTECTION AND LOCAL PUC



STATIC PRESSURE : 50 PSI UNDERGROUND TYPE & SIZE: 12" PVC

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1-3/4	0.995	48	38	549
2	1	2-1/2	0.9	45	18	716
3	2	2-1/2	0.9	45	14	1262

FIRST FOR FIRE, LIFE SAFETY & SECURITY

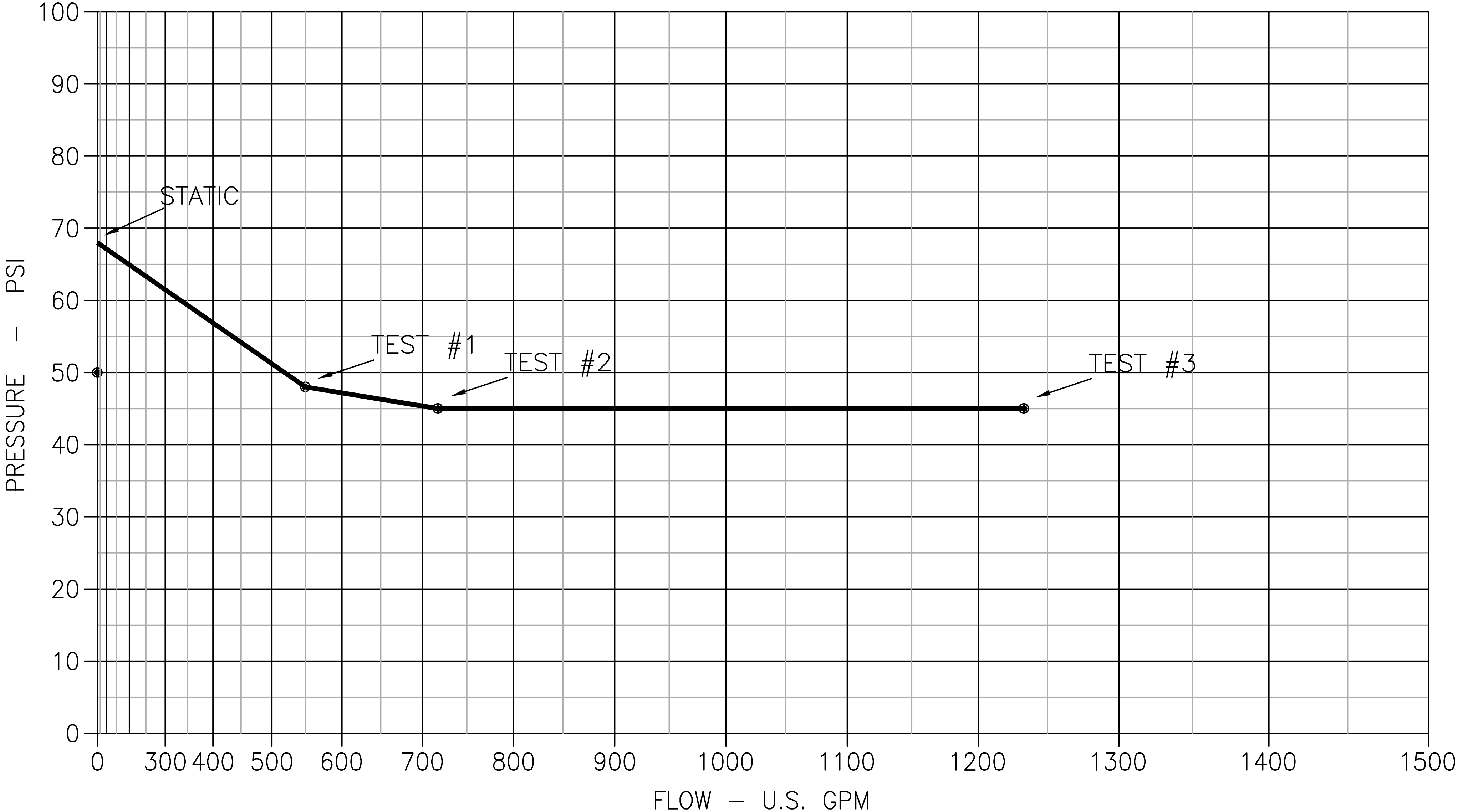
VIPOND INC

est. 1945

440 ESSA ROAD	BY : GUS A.
BARRIE	OFFICE : BARRIE
ONTARIO	TEST BY : VIPOND & PUC
	DATE : SEPTEMBER 22, 2020

STATIC: 50 PSI

	RESIDUAL:		FLOW:
TEST#1	48 PSI	@	549 GPM
TEST#2	45 PSI	@	716 GPM
TEST#3	45 PSI	@	1262 GPM



Appendix B

Sanitary Servicing Calculations

Sean Homes - Phase 3
Sanitary Flow Calculations

Design Criteria

Flow per capita (Q):	350	L/cap/day	
Peak Flow	Qp = P * Q * M / 86400		
Peaking Factor (Harmon Formula)	M = 1 + (14 / (4 + (P / 1000) ^ 0.5))		2 <= "M" <= 4

Site Data

Description	Density	Units	Flow Rate
Townhomes	2.34 person/unit	12 units	350 L/cap/d
Apartments	1.67 person/unit	83 units	350 L/cap/d

Calculate Population

Pop. = 2.34 x 12 + 1.67 x 83

Pop. = 167 people

Calculate Average Daily Flows

$$ADF = \frac{350 \times 167}{86400}$$

ADF = 0.68 L/s

Calculate Peaking Factor

$$M = 1 + \frac{14}{4 + \left(\frac{166.69}{1{,}000}\right)^{0.5}}$$

M = 4.00

Calculate Peak Flow

Qp = 0.68 x 4.00

= 2.70 L/s

PEARSON ENGINEERING LTD.

Sean Homes, Phase 3
Sanitary Sewer Design Sheet

n=0.013
Q_p=(P/1000)*Q*M/86.4 (Q = 450 l/day/person)
M = 1+(14/(4+(P/1000)^0.5)) (1.5<="M"<=4)
Q_i = 20,000 L/d/ha = 0.23 L/s/ha
$Q_{Total} = Q_p + Q_i$

Design Period = 20 Years
Q_{Design} = 35 m^3/ha/d (Commercial)
Velocity (V): > 0.6 m/s & < 3.0 m/s
Minimum Grade: > 0.5%
D_{min} = 200 mm
Population (P) = 24 Units/ha or 4.0 PPL/Unit

FILE: 12089.02
CONTRACT/PROJECT: Sean Homes
DATE: 27-Jan-23

AREA NO	STREETS	MANHOLE		LAND USE	AREA	Qp	LENGTH	Q	TOTAL Q	D	S	Q FULL	V FULL	PERCENT FULL
		FROM	TO		(ha)	(cu.m/d/ha)	(m)	(l/s)	(l/s)	(mm)	(%)	(l/s)	(m/s)	(%)
Area 1				A (C4)										
ESSA ROAD		SAB05107	SAB05108		1.55	63.00	87.5	1.13	1.10	250	0.50	42.06	0.86	2.62
Area 2				A (C4)	0.42	63.00		0.31	0.30					
Sean Mason Homes 369-379 Essa Rd.(Area 3&6)				RH(RA3)		210.00		2.43						
Area 4				R1	0.37	44.00		0.19	0.20					
ESSA ROAD		SAB05108	SAB05109				75.0		**0.40**	250	1.00	59.48	1.21	0.67
Sean Mason Homes Phase 2				RH(RA3)					**1.86**					
Sean Mason Homes Phase 3				RH(RA3)					**2.70**					
Area 5				R1	0.54	44.00		0.28	0.30					
ESSA ROAD		SAB05109	SAB05110						**8.86**	250	1.50	72.85	1.48	12.16
Area 7				RH(RA3)	0.93	571.50		6.15	6.20					
Area 8				R1	0.29	44.00		0.15	0.10					
Area 9				RH(RA3)	0.36	571.50		2.38	2.40					
ESSA ROAD		SAB05110	SAB05111						**17.56**	250	0.50	42.06	0.86	41.75
Area 10				RH(RA3)	1.13	571.50		7.47	7.50					
ESSA ROAD		SAB05112	SAB05111							250	0.50	42.06	0.86	
Easement		SAB05111	Ex. MH						**25.06**	300	0.30	52.97	0.75	47.31

Appendix C

Stormwater Management Calculations

Sean Mason Homes - Phase 3
Calculation of Runoff Coefficients

POST DEVELOPMENT TOTAL AREA TO CITY VIEW SWM POND (CATCHMENT 216)

Runoff Coefficient	=	0.20	0.95	0.95	0.40	0.95	Runoff	Total
Surface Cover	=	Grass	Asphalt	Building	Gravel	Conc.	Coefficient	Impervious (%)
Post Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
1	1868	523	456	793	0	96	0.74	72%
2	3651	732	1373	1410	0	135	0.80	80%
3	1442	1442	0	0	0	0	0.20	0%
6	2405	535	282	1549	0	39	0.78	78%
8	468	189	279	0	0	0	0.65	60%
9	89	89	0	0	0	0	0.20	0%
Total	9923	3421	2111	3752	0	270	0.66	62%

POST DEVELOPMENT UNCONTROLLED AREA TO ESSA ROAD

Runoff Coefficient	=	0.20	0.95	0.95	0.40	0.95	Runoff	Total
Surface Cover	=	Grass	Asphalt	Building	Gravel	Conc.	Coefficient	Impervious (%)
Post Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
4	843	465	0	378	0	0	0.54	45%
7	149	149	0	0	0	0	0.20	0%
Total	993	614	0	378	0	0	0.49	38%

POST DEVELOPMENT AREA DRAINING UNCONTROLLED BYPASSING CITY VIEW SWM POND

Runoff Coefficient	=	0.20	0.95	0.95	0.40	0.95	Runoff	Total
Surface Cover	=	Grass	Asphalt	Building	Gravel	Conc.	Coefficient	Impervious (%)
Post Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
5	1111	809	0	302	0	0	0.40	27%
Total	1111	809	0	302	0	0	0.40	27%

PEARSON ENGINEERING

Sean Mason Homes - Phase 3
Post Development Peak Flows

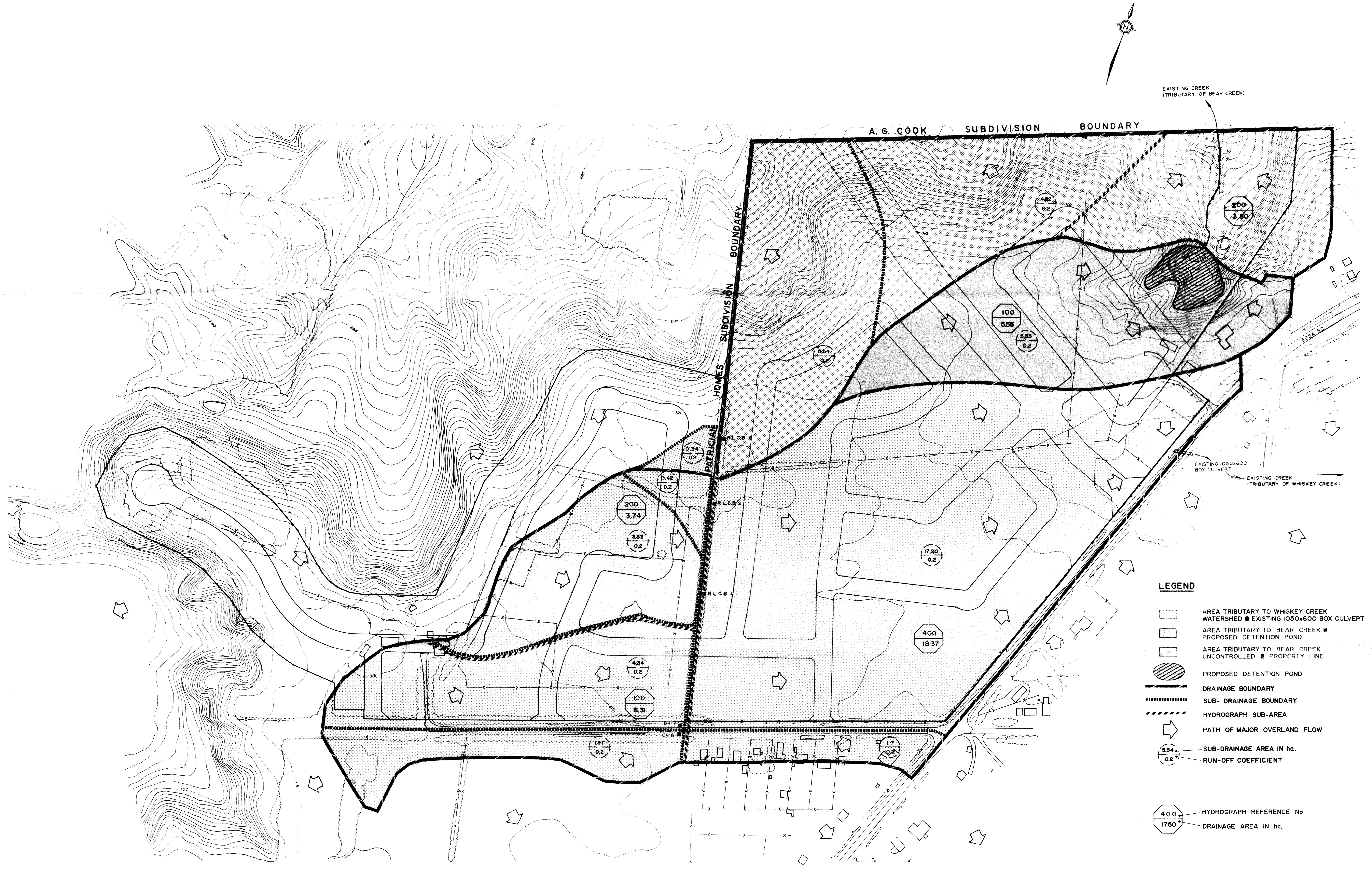
City of Barrie

Storm (yrs)	Coeff A	Coeff B	Coeff C
2	**678.085**	**4.699**	**-0.781**
5	**853.608**	**4.699**	**-0.766**
10	**975.865**	**4.699**	**-0.76**
25	**1146.275**	**4.922**	**-0.757**
50	**1236.152**	**4.699**	**-0.751**
100	**1426.408**	**5.273**	**-0.759**

Modified Rational Method
$Q = C_iCIA / 360$

Where:
Q - Flow Rate (m^3/s)
Ci - Peaking Coefficient
C - Rational Method Runoff Coefficient
I - Storm Intensity (mm/hr)
A - Area (ha.)

Area Number	6	
Area	0.24	ha
Runoff Coefficient	0.78	
Time of Concentration	10	min
Return Rate	2	year
Peaking Coefficient (C_i)	1	
Rainfall Intesity	83.1	mm/hr
Post Development Peak Flow	0.04	m^3/s
Return Rate	5	year
Peaking Coefficient (C_i)	1	
Rainfall Intesity	108.9	mm/hr
Post Development Peak Flow	0.06	m^3/s
Return Rate	10	year
Peaking Coefficient (C_i)	1	
Rainfall Intesity	126.5	mm/hr
Post Development Peak Flow	0.07	m^3/s
Return Rate	25	year
Peaking Coefficient (C_i)	1.1	
Rainfall Intesity	148.2	mm/hr
Post Development Peak Flow	0.09	m^3/s
Return Rate	50	year
Peaking Coefficient (C_i)	1.2	
Rainfall Intesity	164.2	mm/hr
Post Development Peak Flow	0.10	m^3/s
Return Rate	100	year
Peaking Coefficient (C_i)	1.25	
Rainfall Intesity	180.2	mm/hr
Post Development Peak Flow	0.12	m^3/s



TENDER DOCUMENTS FEBRUARY 28, 1991

GENERAL NOTES

APPROVED

REGISTERED PROFESSIONAL ENGINEER
A. A. CECUTTI
PROVINCE OF ONTARIO

BENCH MARKS

ELEVATION 316.10 (U. No. 713841)

CONCRETE PIER AT THE WEST END OF HARVIE ROAD (INNISFIL CONCESSION No. XIII) ON WEST SIDE OF LANEWAY TO PETER M. HARVIE'S HOUSE , 0.6 km WEST OF INTERSECTION WITH HIGHWAY No. 27 , 16.8m SOUTHWEST OF MAIL BOX , 4.7m SOUTH OF CENTRE LINE OF HARVIE ROAD , 4.4m WEST OF CENTRE LINE OF LANEWAY AND ROAD TO A FIELD ,TABLET IN TOP.

NO	REVISIONS	DATE	APPROVED

CITY OF BARRIE
APPROVED
DATE.........
CITY ENGINEER

R.G. Robinson and Associates Ltd. Consulting Engineers Barrie 705-721-9222

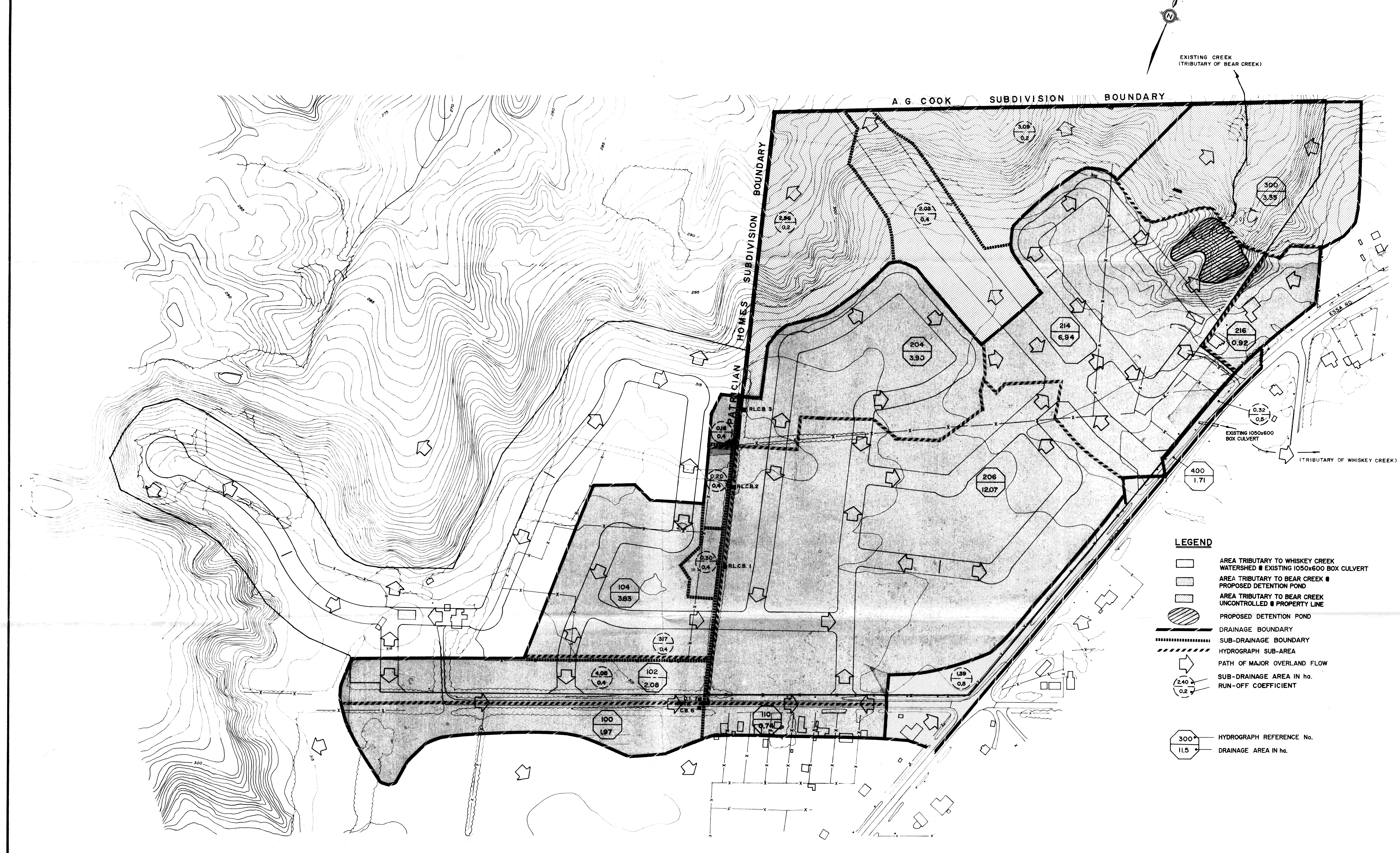
CITY VIEW DEVELOPMENTS

EXTERNAL STORM TRIBUTARY AREAS
PRE-DEVELOPMENT

CITY OF BARRIE INCORPORATED 1853

CITY of BARRIE
ENGINEERING DEPARTMENT

DESIGN SN./J.F.	SCALE HOR. 1 : 2000		
DRAWN C.D.C.	REVIEWED T.A.C.	DRAWING No. D-1	
DATE FEB. /90	26-8851-20		



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Nº	REVISIONS	DATE	APPROVED

CITY OF BARRIE
APPROVED
DATE..........
CITY ENGINEER

R.G. Robinson and Associates Ltd. — Consulting Engineers, Barrie 705-721-9222

CITY VIEW DEVELOPMENTS

EXTERNAL STORM TRIBUTARY AREAS
POST DEVELOPMENT

CITY OF BARRIE · INCORPORATED 1853 ·

CITY of BARRIE
ENGINEERING DEPARTMENT

DESIGN SN./J.F.	SCALE HOR. 1 : 2000	
DRAWN C.D.C.	REVIEWED T.A.C.	DRAWING Nº D-2
DATE FEB./90	26-8851-20	

Appendix D

Phosphorus Budget

PEARSON ENGINEERING

Sean Mason Homes - Phase 3
Phosphorus Loading

	Low Intensity Development	High Intensity Development	Pasture	Forest
Phosphorus Export (kg/ha/year)	0.13	1.32	0.07	0.05

Pre-Development Condition

	Low Intensity Development	High Intensity Development	Pasture	Forest
Area (ha):	0.28	0.00	0.00	0.00
Total P (kg) :	0.04	0.00	0.00	0.00
Total Pre-Development P (kg) :		**0.04**		

Post Development Condition

	Low Intensity Development	High Intensity Development	Pasture	Forest
Area (ha):	0.00	0.28	0.00	0.00
Total P (kg) :	0.00	0.37	0.00	0.00
Without Treatment				
Total Post Development (kg):		0.37		
Dry Pond Treatment				
Contributing Area (ha):		0.24		
Total P (kg):		0.32		
Dry Pond Proficiency (%):		10		
P Removed (kg):		0.03		
Total Post Development P (kg) :		**0.33**		

Appendix E

Water Balance Calculations

Sean Mason Homes - Phase 3
Pre Development Water Balance

Catchment Designation	Site			
	Grassed	Paved	Total	
Area	2768	0	2768	
Pervious Area	2768	0	2768	
Impervious Area	0	0	0	
Infiltration Factors				
Topography Infiltration Factor	0.2	0		(From MOE Table 3.1 for Rolling Land)
Soil Infiltration Factor	0.3	0		(From MOE Table 3.1 for an average value between Medium combinations of clay and loam and Open sandy loam)
Land Cover Infiltration Factor	0.1	0		(From MOE Table 3.1 for Cultivated Land)
MOE Infiltration Factor	0.6	0		
Actual Infiltration Factor	0.6	0		
Run-Off Coeffiecient	0.4	1		
Runoff from Impervious Surfaces*	0	0.8		
Inputs (per Unit Area)				
Precipitation	932.9	932.9	932.9	(Precipitation values from Environment Canada)
Run-On	0	0	0	
Other Inputs	0	0	0	
Total Inputs	932.9	932.9	932.9	
Outputs (per Unit Area)				
Precipitation Surplus	371.9	746.3	371.9	
Net Surplus	371.9	746.3	371.9	
Evapotranspiration	561.0	186.6	561.0	(Evapotranspiration values from Table 5-2 in the City of Barrie Tier Three Recharge Estimation, dated June 2012)
Infiltration	223.1	0.0	223.1	
Rooftop Infiltration	0.0	0.0	0.0	
Total Infiltration	223.1	0.0	223.1	
Runoff Pervious Areas	148.8	0.0	148.8	
Runoff Impervious Areas	0.0	746.3	0.0	
Total Runoff	148.8	746.3	148.8	
Total Outputs	932.9	932.9	932.9	
Difference (Inputs - Outputs)	0.0	0.0	0.0	
Inputs (Volumes)				
Precipitation	2582	0	2582	
Run-On	0	0	0	
Other Inputs	0	0	0	
Total Inputs	2582	0	2582	
Outputs (Volumes)				
Precipitation Surplus	1029	0	1029	
Net Surplus	1029	0	1029	
Evapotranspiration	1553	0	1553	
Infiltration	618	0	618	
Rooftop Infiltration	0	0	0	
Total Infiltration	618	0	618	
Runoff Pervious Areas	412	0	412	
Runoff Impervious Areas	0	0	0	
Total Runoff	412	0	412	
Total Outputs	2582	0	2582	
Difference (Inputs - Outputs)	0	0	0	

Note: Highlighted cells are input cells.

Sean Mason Homes - Phase 3
Post Development Water Balance (No Infiltration)

Catchment Designation	Site				
	Grassed	Paved	Building	Total	
Area	898	321	1549	2768	
Pervious Area	898	0	0	898	
Impervious Area	0	321	1549	1870	
Infiltration Factors					
Topography Infiltration Factor	0.2	0	0		(From MOE Table 3.1 for Rolling Land)
Soil Infiltration Factor	0.3	0	0		(From MOE Table 3.1 for an average value between Medium combinations of clay and loam and Open sandy loam)
Land Cover Infiltration Factor	0.1	0	0		
MOE Infiltration Factor	0.6	0	0		
Actual Infiltration Factor	0.6	0	0		
Run-Off Coeffiecient	0.4	1	1		
Runoff from Impervious Surfaces*	0	0.8	0.8		
Inputs (per Unit Area)					
Precipitation	932.9	932.9	932.9	932.9	(Precipitation values from Environment Canada)
Run-On	0	0	0	0	
Other Inputs	0	0	0	0	
Total Inputs	932.9	932.9	932.9	932.9	
Outputs (per Unit Area)					
Precipitation Surplus	371.9	746.3	746.3	624.8	
Net Surplus	371.9	746.3	746.3	624.8	
Evapotranspiration	561.0	186.6	186.6	308.1	(Evapotranspiration values from Table 5-2 in the City of Barrie Tier Three Recharge Estimation, dated June 2012)
Infiltration	223.1	0.0	0.0	72.4	
Rooftop Infiltration	0.0	0.0	0.0	0.0	
Total Infiltration	223.1	0.0	0.0	72.4	
Runoff Pervious Areas	148.8	0.0	0.0	48.3	
Runoff Impervious Areas	0.0	746.3	746.3	504.2	
Total Runoff	148.8	746.3	746.3	552.4	
Total Outputs	932.9	932.9	932.9	932.9	
Difference (Inputs - Outputs)	0.0	0.0	0.0	0.0	
Inputs (Volumes)					
Precipitation	838	299	1445	2582	
Run-On	0	0	0	0	
Other Inputs	0	0	0	0	
Total Inputs	838	299	1445	2582	
Outputs (Volumes)					
Precipitation Surplus	334	239	1156	1730	
Net Surplus	334	239	1156	1730	
Evapotranspiration	504	60	289	853	
Infiltration	200	0	0	200	
Rooftop Infiltration	0	0	0	0	
Total Infiltration	200	0	0	200	
Runoff Pervious Areas	134	0	0	134	
Runoff Impervious Areas	0	239	1156	1396	
Total Runoff	134	239	1156	1529	
Total Outputs	838	299	1445	2582	
Difference (Inputs - Outputs)	0	0	0	0	

Note: Highlighted cells are input cells.

Recharge Compensation Form

Application Details

Site Name (Developer): Sean Mason Homes
Site Location: 405 Essa Road, Barrie
File # D30-011-2021
APID# **89823**
Execution of Compensation Date: **03-Oct-22**
Anticipated Construction Start
Subwatershed: Barrie Creeks

Applicable Policy:
- WHPA-Q2 ○
- WBOP ◉
- None ○

Water Balance

Pre-Development Infiltration (m^3): 618
Post-Development Infiltration (m^3): 200
Deficit (m^3): **418**
Reason for infiltration not able to be maintained on site: Silty clay soil and high water table conditions.

Compensation Costs

Required volume of storage facility: 18.39
Compensation Cost: $21,150.80

LSRCA Recharge Compensation Cost Table

Water Balance Deficit (m^3/yr)	Storage Volume Required [1] (m^3)	Cost per m^3 of storage volume	Cost	Administration (15%)
100	4.4	$ 1,000.00	$ 4,400.00	$ 660.00
200	8.8	$ 1,000.00	$ 8,800.00	$ 1,320.00
300	13.2	$ 1,000.00	$ 13,200.00	$ 1,980.00
400	17.6	$ 1,000.00	$ 17,600.00	$ 2,640.00
500	22.0	$ 1,000.00	$ 22,000.00	$ 3,300.00
600	26.4	$ 1,000.00	$ 26,400.00	$ 3,960.00
700	30.8	$ 1,000.00	$ 30,800.00	$ 4,620.00
800	35.2	$ 1,000.00	$ 35,200.00	$ 5,280.00
900	39.6	$ 1,000.00	$ 39,600.00	$ 5,940.00
1000	44.0	$ 1,000.00	$ 44,000.00	$ 6,600.00
1100	48.4	$ 1,000.00	$ 48,400.00	$ 7,260.00
1200	52.8	$ 1,000.00	$ 52,800.00	$ 7,920.00
1300	57.2	$ 1,000.00	$ 57,200.00	$ 8,580.00
1400	61.6	$ 1,000.00	$ 61,600.00	$ 9,240.00
1500	66.0	$ 1,000.00	$ 66,000.00	$ 9,900.00
1600	70.4	$ 1,000.00	$ 70,400.00	$ 10,560.00
1700	74.8	$ 1,000.00	$ 74,800.00	$ 11,220.00
1800	79.2	$ 1,000.00	$ 79,200.00	$ 11,880.00
1900	83.6	$ 1,000.00	$ 83,600.00	$ 12,540.00
2000	88.0	$ 1,000.00	$ 88,000.00	$ 13,200.00

Notes: [1] LID sizing based on capturing 95% of annual rainfall (25mm)

Appendix F

Oil & Grit Separator Information

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

CDS Hydrodynamic Separator®

Developed by CONTECH Engineered Solutions LLC
Scarborough, Maine, USA

Registration: GPS-ETV_VR2020-03-31_CDS_r1

In accordance with

ISO 14034:2016

Environmental Management —
Environmental Technology Verification (ETV)

John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

March 31, 2020
Vancouver, BC, Canada

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The CDS® is a Stormwater treatment device designed to remove pollutants, including sediment, trash and hydrocarbons from Stormwater runoff. The CDS is typically comprised of a manhole that houses flow and screening controls that use a combination of swirl concentration and continuous deflective separation.

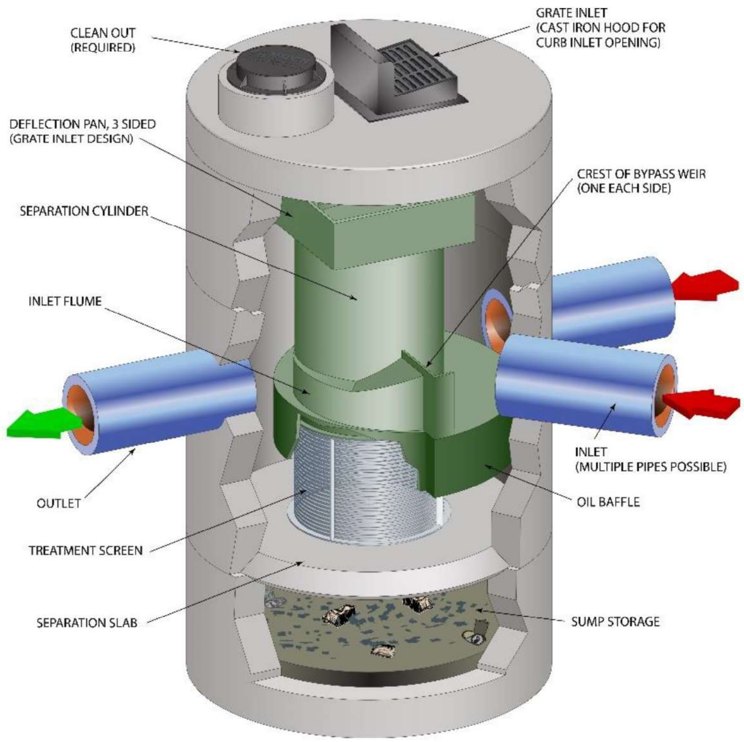

Figure 1. Graphic of typical inline CDS unit and core components.

When stormwater runoff enters the CDS unit, treatment flows are routed through one of two inlet flumes into the separation chamber. During high intensity rain events the water surface elevation in the system rises and once flows exceed the capacity of the inlet flumes a portion of flow begins to overtop the weirs at the top of the flumes which serve as an internal bypass. Flows routed over the internal bypass are then conveyed to the outlet. The water and associated gross pollutants contained within the separation cylinder are kept in continuous circular motion by the energy generated from the incoming flow. This has the effect of a continuous deflective separation of the pollutants and their eventual deposition into the sump storage below. A perforated screen plate allows the filtered water to pass through to a volute return system and thence to the outlet pipe. The oil and other light liquids are retained within the oil baffle. Figure 1 shows a schematic representation of a typical CDS unit including critical components

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Contech CDS-4 OGS device, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program requirements. A copy of the Procedure may be accessed at www.etvcanada.ca.

Performance claim(s)

Capture test[1]:

During the sediment capture test, the Contech CDS OGS device with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removed 74, 70, 63, 53, 45, 42, 32 and 23 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, 1400 and 1893 L/min/m^2, respectively.

Scour test[a]:

During the scour test, the Contech CDS OGS device with preloaded test sediment reaching 50% of the manufacturer's recommended maximum sediment storage depth, generated corrected effluent concentrations of 1.8, 6.5, 8.2, 11.2, and 309.3 mg/L during a test run[2] with approximately 5 minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test[a]:

During the light liquid re-entrainment test, the Contech CDS OGS device with surrogate low-density polyethylene beads preloaded within the oil collection skirt area, representing floating liquid to a volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.9, 98.6, 99.5, and 99.7 percent of loaded beads by volume during a test run[2] with 5 minutes duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

[1] The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)

[2] See variance #1 in "Variances from testing procedure" section below.

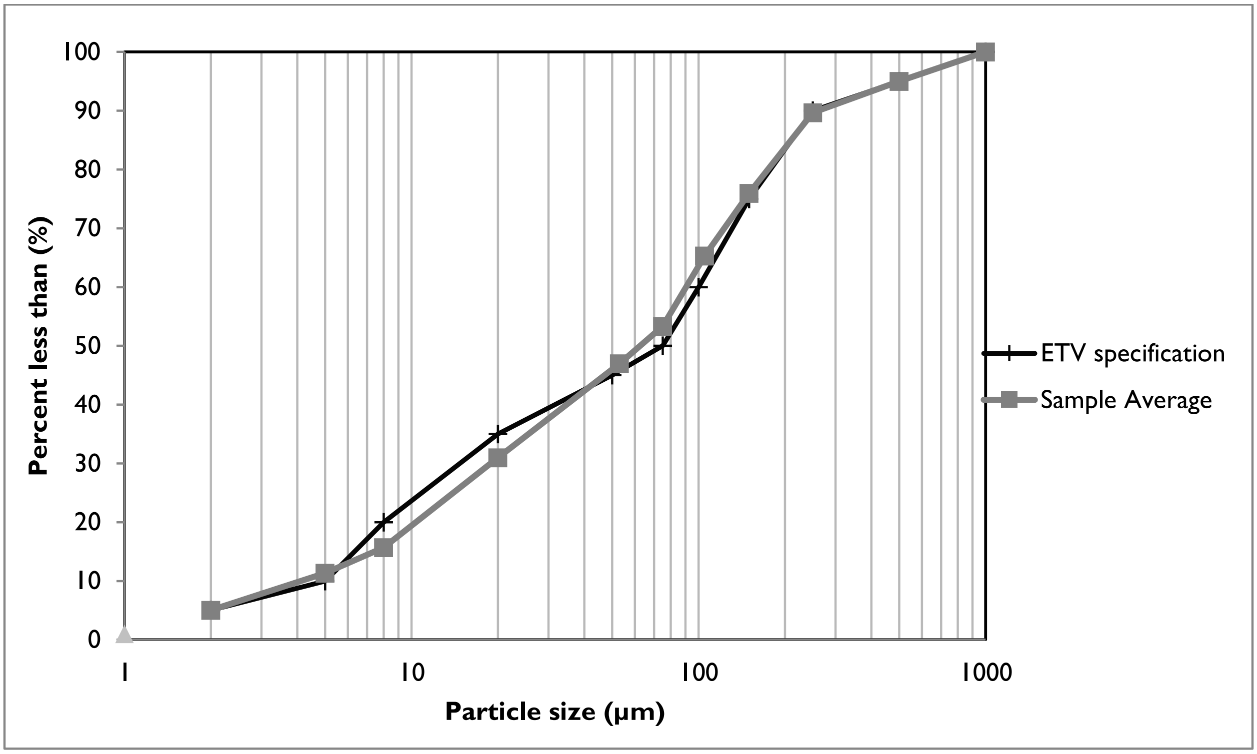

Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at eight surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1).

In some instances, the calculated removal efficiencies were above 100% for certain particle size fractions (marked with asterisks in Table 1). These discrepancies are not entirely avoidable and may be attributed to errors relating to the blending of sediment, collection of representative samples, and laboratory analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see Bulletin # CETV 2016-11-0001). The results for "all particle sizes by mass balance" in Table 1 are based on measurements of the total injected and retained sediment mass, and are therefore not subject to sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) at specified surface loading rates.

Particle size fraction (µm)	Surface loading rate (L/min/m²)							
	40	80	200	400	600	1000	1400	1893
>500	100	100*	66	79	97	100*	84	77
250 - 500	100*	100*	85	95	100*	91	100*	75
150 - 250	99	100*	100*	97	100	75	68	37
105 - 150	100	100*	100*	74	47	45	30	27
75 - 105	90	91	100*	61	33	36	26	18
53 - 75	71	27	54	100	42	44	15	16
20 - 53	65	51	20	8	10	8	5	4
8 - 20	28	22	9	7	1	1	2	1
5 – 8	30	9	0	8	2	0	1	0
<5	11	8	16	2	6	5	2	2
All particle sizes by mass balance	**73.5**	**70.3**	**63.4**	**52.6**	**45.1**	**41.5**	**32.4**	**23.0**

* Removal efficiencies were calculated to be above 100%. Calculated values typically ranged between 101 and 175% (average 126%). Higher values were observed for the >500 µm and 150-250 µm size fractions during the 80 L/min/m² test run. See text and Bulletin # CETV 2016-11-0001 for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the retained sediment at each of the tested surface loading rates. As expected, the capture efficiency for fine particles was generally found to decrease as surface loading rates increased.

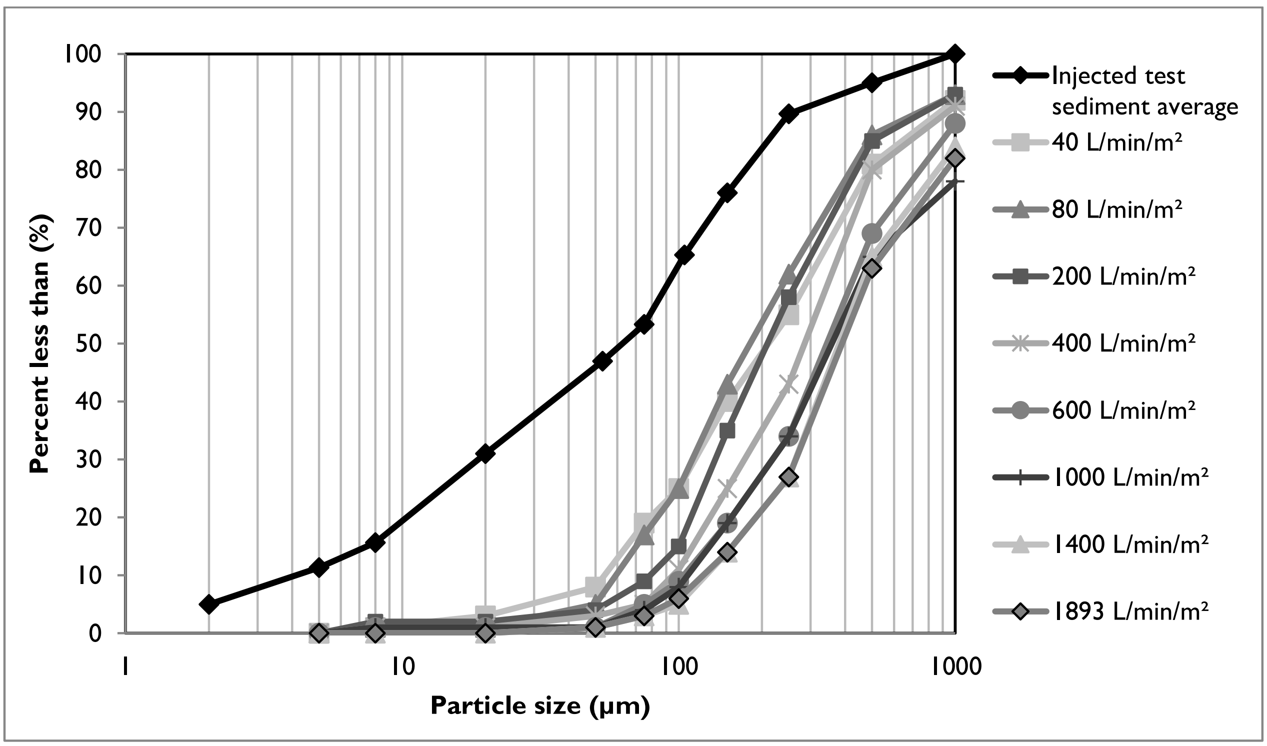

Figure 3. Particle size distribution of retained sediment in relation to the injected test sediment average.

Table 2 shows the results of the sediment scour and re-suspension test. This test involved preloading 10.2 cm of fresh test sediment into the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth. Sediment was also pre-loaded to the same depth on the separation slab (see Figure 1) since sediment was observed to have been deposited in this area during the sediment capture test. Clean water was run through the device at five surface loading rates over a 36 minute period. The test was stopped and started after the second flow rate in order to change flow meters. Each flow rate was maintained for 5 minutes with a one minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for Suspended Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water and the smallest 5% of particles captured during the 40 L/min/m² sediment capture test, as per the method described in Bulletin # CETV 2016-09-0001.

Table 2. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m²)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L)[†]	Average (mg/L)
1	200	1.03	0.5	1.0	1.8
		2.03		1.6	
		3.03		1.8	
		4.03		1.8	
		5.03		2.6	
2	800	6.23	2.0	5.0	6.5
		7.23		6.7	
		8.23		9.4	
		9.23		5.4	
		10.23		5.9	
3	1400	11.43[‡]	2.0	3.1	8.2
		12.43		11.0	
		13.43		14.6	
		14.43		7.1	
		15.43		5.2	
4	2000	17.20	3.2	7.3	11.2
		18.20		22.8	
		19.20		6.9	
		20.20		6.8	
		21.20		12.1	
5	2600	22.40	8.5	248.5	309.3
		23.40		83.0	
		24.40		438.9	
		25.40		338.7	
		26.40		437.5	

[†] The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the smallest 5% of sediment particles (i.e. d5) removed during the 40 L/min/m² capture test, minus the background concentration. For more information see Bulletin # CETV 2016-09-0001.

[‡] See variance #1 in "Variances from testing procedure" section below.

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 3. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m²) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m²) over a 38 minute period. As with the sediment scour test, flow was stopped and started after the second flow rate to change flow meters. Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 3. Light liquid re-entrainment test results.

Target Flow (L/min/m²)	Time Stamp	Collected Volume (L)	Collected Mass (g)	Percent re-entrained by volume	Percent retained by volume
200	10:48:42	27 pellets	0.8	0.01	99.99
800	10:55:09	0.07	41	0.12	99.88
1400	11:06:59	0.8	439	1.37	98.63
2000	11:13:00	0.31	177	0.53	99.47
2600	11:19:00	0.18	98	0.31	99.69
Interim Collection Net		0.025	14.2	0.04	99.96
Total Loaded		58.3	33398	--	--
Total Re-entrained		1.385	770	--	--
Percent Re-entrained and retained		--	--	2.38	97.62

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. It was necessary to change flow meters during the scour and light liquid re-entrainment test, as the required flows exceeded the minimum and/or maximum range of any single meter. After the loading rate of 800 L/min/m², the flow was gradually shut down and re-initiated through the larger meter immediately after closing the valve controlling flows to the small meter. The transition time of 1-minute for each target flow was followed, resulting in an elapsed time of 3 minutes to reach the next target flow of 1400 L/min/m². This procedure was approved by CETV prior to testing, in recognition that most particles susceptible to scour at low flows would not be in the sump at higher flows. Similarly, re-entrainment of the oil beads was not expected to be significantly affected by the flow meter change.

2. As part of the capture test, evaluation of the 40 L/min/m² surface loading rate was split into 3 parts due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit. At the end of the first and second parts of the test, the flow rates were gradually shutdown to prevent capture of particles that would have been washed out under normal circumstances. The amended procedure was reviewed and approved by the verifier prior to testing.

3. Inflow concentrations during the 40 L/min/m² surface loading rate varied from 162 mg/L to 246 mg/L, which is wider than specified ±25 mg/L range in the Procedure.

Verification

This verification was first completed in March 2017 and is considered valid for subsequent renewal periods every three (3) years thereafter, subject to review and confirmation of the original performance and performance claims. The original verification was completed by the Toronto and Region Conservation Authority of Mississauga, Ontario, Canada using the Canadian ETV Program's General Verification Protocol (June 2012) and taking into account ISO 14034:2016. This ETV renewal is considered to meet the equivalency of an ETV verification completed using the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***.

Data and information provided by Contech Engineered Solutions to support the performance claim included the following: Performance test report prepared by Alden Research Laboratory, Inc of Holden, Massachusetts, USA and dated February 2015; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV) and was developed and published by the International Organization for Standardization (ISO). The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the CDS Stormwater Treatment System please contact:

CONTECH Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME
04074 USA
Tel: 207-885-9830
info@conteches.com
www.conteches.com

For more information on ISO 14034:2016 / ETV please contact:

GLOBE Performance Solutions
404 – 999 Canada Place
Vancouver, BC
V6C 3E2 Canada
Tel: 604-695-5018 / Toll Free: 1-855-695-5018
etv@globeperformance.com
www.globeperformance.com

Appendix G

Letters to Utilities

PEARSON ENGINEERING

July 30, 2021 File:12089.02

Attention: Lorraine Cibirka

Bell Canada
Access Network Design
2nd Floor, 136 Bayfield Street
Barrie, Ontario
L4M 3B1

Dear Lorraine,

Re: Proposed Residential Development
405 Essa Road, Barrie
Request for Confirmation – Bell Canada Servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a proposed residential development located at 405 Essa Road in Barrie. The development proposes construction of an 8-storey condo building with townhouse units facing Essa Road and City View Circle and underground parking. The site is currently an existing residential site and the proposed development can be found on the attached Figure 2.

We request that, if available, you provide us your existing servicing and plan in this area, and we would appreciate any comments you could provide on the serviceability of the proposed development.

We thank you in advance for your assistance and co-operation in providing the background data. If you have any questions regarding the enclosed or require any additional information, please feel free to give me a call at (705) 719-4785 ext. 223.

Regards,
PEARSON ENGINEERING LTD.

Taylor Arkell

Taylor Arkell, P.Eng.
Senior Project Manager

PEARSON ENGINEERING

July 30, 2021 File:12089.02

Attention: David Smith

Enbridge
10 Churchill Dr.
Barrie ON
L4N 8Z5

Dear David,

Re: Proposed Residential Development
405 Essa Road, Barrie
Request for Confirmation – Enbridge servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a proposed residential development located at 405 Essa Road in Barrie. The development proposes construction of an 8-storey condo building with townhouse units facing Essa Road and City View Circle and underground parking. The site is currently an existing residential site and the proposed development can be found on the attached Figure 2.

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Regards,
PEARSON ENGINEERING LTD.

Taylor Arkell, P.Eng.
Senior Project Manager

PEARSON ENGINEERING

July 30, 2021 File:12089.02

Attention: Stephen Cranley

Power Stream Inc.
55 Patterson Road
Barrie, ON
L4N 3W2

Dear Stephen,

Re: Proposed Residential Development
405 Essa Road, Barrie
Request for Confirmation – Electric servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a proposed residential development located at 405 Essa Road in Barrie. The development proposes construction of an 8-storey condo building with townhouse units facing Essa Road and City View Circle and underground parking. The site is currently an existing residential site and the proposed development can be found on the attached Figure 2.

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Regards,
PEARSON ENGINEERING LTD.

Taylor Arkell, P.Eng.
Senior Project Manager

PEARSON ENGINEERING

July 30, 2021 File:12089.02

Attention: Xinyi Wang

Rogers Cable
1 Sperling Drive
Barrie, Ontario
L4M 6B8

Dear Xinyi,

Re: Proposed Residential Development
405 Essa Road, Barrie
Request for Confirmation – Rogers servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a proposed residential development located at 405 Essa Road in Barrie. The development proposes construction of an 8-storey condo building with townhouse units facing Essa Road and City View Circle and underground parking. The site is currently an existing residential site and the proposed development can be found on the attached Figure 2.

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Regards,
PEARSON ENGINEERING LTD.

Taylor Arkell, P.Eng.
Senior Project Manager

Appendix H

Excerpts from Stormwater Management Report by Pearson Engineering, Sean Mason Homes – Ph 2, June 2017

Sean Mason Homes - Phase 2
Calculation of Runoff Coefficients

POST DEVELOPMENT AREA TO CITY VIEW SWM POND

Runoff Coefficient	=	0.20	0.95	0.95	0.40	0.95	Runoff	Total
Surface Cover	=	Grass	Asphalt	Building	Gravel	Conc.	Coefficient	Impervious (%)
Post Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
1	2205	600	651	859	0	95	0.75	73%
2	3651	732	1373	1410	0	135	0.80	80%
3	1475	1475	0	0	0	0	0.20	0%
Total	7332	2807	2025	2269	0	230	0.66	62%

POST DEVELOPMENT UNCONTROLLED AREA TO ESSA ROAD

Runoff Coefficient	=	0.20	0.95	0.95	0.40	0.95	Runoff	Total
Surface Cover	=	Grass	Asphalt	Building	Gravel	Conc.	Coefficient	Impervious (%)
Post Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
4	865	304	102	410	0	49	0.69	65%
Total	865	304	102	410	0	49	0.69	65%

POST DEVELOPMENT UNCONTROLLED AREA TO CITY VIEW SWM POND

Runoff Coefficient	=	0.20	0.95	0.95	0.40	0.95	Runoff	Total
Surface Cover	=	Grass	Asphalt	Building	Gravel	Conc.	Coefficient	Impervious (%)
Post Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
5	1111	809	0	302	0	0	0.40	27%
Total	1111	809	0	302	0	0	0.40	27%

POST DEVELOPMENT TOTAL AREA TO CITY VIEW SWM POND (CATCHMENT 216)

Runoff Coefficient	=	0.20	0.95	0.95	0.40	0.95	Runoff	Total
Surface Cover	=	Grass	Asphalt	Building	Gravel	Conc.	Coefficient	Impervious (%)
Post Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
	7332	2807	2025	2269	0	230	0.66	62%
	2483	993	497	993	0	0	0.65	60%
Total	9814	3800	2521	3262	0	230	0.66	61%

PEARSON ENGINEERING LTD.

Sean Mason Homes - Phase 2
Stage-Storage-Discharge Table

Elevation (m)	Depth (m)	Cum. Vol. (m^3)	Orifice 1 Head (m)	Orifice 1 Flow (m^3/s)	Orifice 2 Head (m)	Orifice 2 Flow (m^3/s)	Weir Manhole Head (m)	Weir Manhole Flow (m^3/s)	Weir Spillway Head (m)	Weir Spillway Flow (m^3/s)	Total Flow (m^3/s)
295.40	0.0	0	0.01	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000
296.50	1.1	502	1.12	0.064	0.00	0.000	0.00	0.000	0.00	0.000	0.064
298.00	2.6	2651	2.62	0.098	0.00	0.000	0.00	0.000	0.00	0.000	0.098
299.00	3.6	5063	3.62	0.115	0.00	0.000	0.00	0.000	0.00	0.000	0.115
299.50	4.1	4899	4.12	0.122	0.00	0.000	0.00	0.000	0.00	0.000	0.122
299.60	4.2	5425	4.22	0.124	0.00	0.000	0.00	0.000	0.00	0.000	0.124
299.70	4.3	5951	4.32	0.125	0.10	0.152	0.00	0.000	0.00	0.000	0.277
299.80	4.4	6476	4.42	0.127	0.20	0.215	0.00	0.000	0.00	0.000	0.342
299.90	4.5	7002	4.51	0.128	0.30	0.263	0.00	0.000	0.00	0.000	0.392
300.00	4.6	7528	4.62	0.130	0.40	0.304	0.00	0.000	0.00	0.000	0.434
300.50	5.1	9225	5.12	0.136	0.90	0.456	0.00	0.000	0.00	0.000	0.593
300.60	5.2	9540	5.22	0.138	1.00	0.481	0.00	0.000	0.00	0.000	0.619
300.70	5.3	9861	5.32	0.139	1.10	0.504	0.00	0.000	0.00	0.000	0.643
300.80	5.4	10262	5.42	0.140	1.20	0.527	0.00	0.000	0.00	0.000	0.667
300.90	5.5	10672	5.51	0.142	1.30	0.548	0.00	0.000	0.00	0.000	0.690
301.00	5.6	11090	5.62	0.143	1.40	0.569	0.10	0.278	0.00	0.000	0.990
301.10	5.7	11450	5.72	0.144	1.50	0.589	0.20	0.787	0.10	0.814	2.334
301.20	5.8	11830	5.82	0.145	1.60	0.608	0.30	1.446	0.20	2.326	4.526
301.30	5.9	12200	5.92	0.147	1.70	0.627	0.40	2.226	0.30	4.316	7.316

Orifice 1	
Diameter	170 mm
Invert Elevation	295.30
Orifice Constant	0.60
Orifice Centroid	295.39
Orifice Formula	$0.63\pi(D/2000)^2x(2x9.81xH)^{0.5}$

Orifice 2	
Diameter	480 mm
Invert Elevation	299.40
Orifice Constant	0.60
Orifice Centroid	299.60
Orifice Formula	$0.63\pi(D/2000)^2x(2x9.81xH)^{0.5}$

Weir Manhole	
Width	5.65 m (πD)
Weir Coefficient	1.55
Invert of Weir	300.90 m
Weir Formula	$CLH^{1.5}$

Weir Spillway	
Width	16.2 m
Weir Coefficient	1.70
Invert of Weir	301.00
Weir Formula	$CLH^{1.5}$

Pre Development OTTHYMO Schematic

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==========================================================================================================

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

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

Developed and Distributed by Clarifica Inc.


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                   *****  S U M M A R Y   O U T P U T  *****

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: P:\Project Management\2012\12089 - Sean Mason, Essa Rd. Barrie\50 - Design Notes\12089.01 - OTTHYMO\Pre
Development - Ch
  Summary filename: P:\Project Management\2012\12089 - Sean Mason, Essa Rd. Barrie\50 - Design Notes\12089.01 - OTTHYMO\Pre
Development - Ch


DATE: 8/17/2015                            TIME: 16:26:23

USER:


COMMENTS: Pre Development - 4 Hour Chicago Storm


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

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 10.0
      [ Ptot= 36.95 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\2yr_4hr_chi.stm
      remark: 4hr 2year CHICAGO STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0200  1  3.0    3.74     .05  2.00   7.69  .21    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0100  1  3.0    6.31     .11  1.85   7.69  .21    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .31]
*
  **  CALIB NASHYD       0400  1  3.0   18.37     .14  2.85   7.70  .21    .000
      [CN=68.0         ]
      [ N = 3.0:Tp 1.05]
*
  **  CALIB NASHYD       0201  1  3.0    3.80     .10  1.65   7.69  .21    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  **  CALIB NASHYD       0101  1  3.0    5.55     .08  2.00   7.70  .21    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
      ADD [0200 + 0100]  0300  3  3.0   10.05     .16  1.90   7.69  n/a    .000
*
      ADD [0300 + 0400]  0500  3  3.0   28.42     .23  2.10   7.70  n/a    .000
*
      ADD [0201 + 0101]  0301  3  3.0    9.35     .15  1.75   7.69  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 10.0
      [ Ptot= 50.52 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\5yr_4hr_chi.stm
      remark: 4hr 5year CHICAGO STORM - CITY OF BARRIE
```

```
*
  **  CALIB NASHYD       0200  1  3.0    3.74     .10  2.00  13.74  .27    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0100  1  3.0    6.31     .19  1.85  13.74  .27    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .31]
*
  **  CALIB NASHYD       0400  1  3.0   18.37     .25  2.85  13.74  .27    .000
      [CN=68.0         ]
      [ N = 3.0:Tp 1.05]
*
  **  CALIB NASHYD       0201  1  3.0    3.80     .17  1.65  13.73  .27    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  **  CALIB NASHYD       0101  1  3.0    5.55     .14  2.00  13.74  .27    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
      ADD [0200 + 0100]  0300  3  3.0   10.05     .28  1.90  13.74  n/a    .000
*
      ADD [0300 + 0400]  0500  3  3.0   28.42     .41  2.10  13.74  n/a    .000
*
      ADD [0201 + 0101]  0301  3  3.0    9.35     .26  1.70  13.73  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 10.0
      [ Ptot= 59.69 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\10yr_4hr_chi.stm
      remark: 4hr 10year CHICAGO STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0200  1  3.0    3.74     .13  2.00  18.48  .31    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0100  1  3.0    6.31     .26  1.85  18.47  .31    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .31]
*
  **  CALIB NASHYD       0400  1  3.0   18.37     .34  2.85  18.48  .31    .000
      [CN=68.0         ]
      [ N = 3.0:Tp 1.05]
*
  **  CALIB NASHYD       0201  1  3.0    3.80     .22  1.65  18.46  .31    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  **  CALIB NASHYD       0101  1  3.0    5.55     .19  2.00  18.48  .31    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
      ADD [0200 + 0100]  0300  3  3.0   10.05     .38  1.90  18.47  n/a    .000
*
      ADD [0300 + 0400]  0500  3  3.0   28.42     .55  2.10  18.48  n/a    .000
*
      ADD [0201 + 0101]  0301  3  3.0    9.35     .35  1.70  18.47  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 10.0
      [ Ptot= 71.24 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\25yr_4hr_chi.stm
      remark: 4hr 25year CHICAGO STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0200  1  3.0    3.74     .18  1.95  25.05  .35    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0100  1  3.0    6.31     .35  1.85  25.05  .35    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .31]
*
  **  CALIB NASHYD       0400  1  3.0   18.37     .46  2.85  25.05  .35    .000
```

```
      [CN=68.0         ]
      [ N = 3.0:Tp 1.05]
*
  **  CALIB NASHYD       0201  1  3.0    3.80     .31  1.65  25.04  .35    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  **  CALIB NASHYD       0101  1  3.0    5.55     .26  1.95  25.05  .35    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
      ADD [0200 + 0100]  0300  3  3.0   10.05     .52  1.85  25.05  n/a    .000
*
      ADD [0300 + 0400]  0500  3  3.0   28.42     .75  2.10  25.05  n/a    .000
*
      ADD [0201 + 0101]  0301  3  3.0    9.35     .48  1.70  25.04  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 10.0
      [ Ptot= 79.45 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\50yr_4hr_chi.stm
      remark: 4hr 50year CHICAGO STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0200  1  3.0    3.74     .21  1.95  30.08  .38    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0100  1  3.0    6.31     .42  1.85  30.08  .38    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .31]
*
  **  CALIB NASHYD       0400  1  3.0   18.37     .55  2.85  30.08  .38    .000
      [CN=68.0         ]
      [ N = 3.0:Tp 1.05]
*
  **  CALIB NASHYD       0201  1  3.0    3.80     .37  1.60  30.07  .38    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  **  CALIB NASHYD       0101  1  3.0    5.55     .31  1.95  30.08  .38    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
      ADD [0200 + 0100]  0300  3  3.0   10.05     .62  1.85  30.08  n/a    .000
*
      ADD [0300 + 0400]  0500  3  3.0   28.42     .90  2.10  30.08  n/a    .000
*
      ADD [0201 + 0101]  0301  3  3.0    9.35     .58  1.70  30.08  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************


--------------------
|    READ STORM    |    Filename: P:\Design Aids\Storm\HYDROL
|                  |              OGY\StmFiles\City of Barrie - 2010\
|                  |              100yr_4hr_chi.stm
| Ptotal= 87.58 mm |    Comments: 4hr 100year CHICAGO STORM - CITY OF BARR
--------------------
                 TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                  .17     .00 |  1.33   45.22 |  2.50   12.44 |  3.67    6.60
                  .33    6.41 |  1.50  180.15 |  2.67   10.94 |  3.83    6.22
                  .50    7.29 |  1.67   58.54 |  2.83    9.80 |  4.00    5.89
                  .67    8.52 |  1.83   31.96 |  3.00    8.90 |  4.17    5.59
                  .83   10.36 |  2.00   22.45 |  3.17    8.16 |
                 1.00   13.45 |  2.17   17.52 |  3.33    7.56 |
                 1.17   19.96 |  2.33   14.50 |  3.50    7.04 |

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

--------------------
| CALIB            |
| NASHYD    (0200) |   Area    (ha)=   3.74   Curve Number   (CN)= 68.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .41

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 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
              .050     .00 | 1.100   19.96 | 2.150   17.52 |  3.20    7.76
              .100     .00 | 1.150   19.96 | 2.200   15.51 |  3.25    7.56
              .150     .00 | 1.200   36.80 | 2.250   14.50 |  3.30    7.56
              .200    4.27 | 1.250   45.22 | 2.300   14.50 |  3.35    7.39
              .250    6.41 | 1.300   45.22 | 2.350   13.81 |  3.40    7.04
              .300    6.41 | 1.350   90.20 | 2.400   12.44 |  3.45    7.04
              .350    6.70 | 1.400  180.15 | 2.450   12.44 |  3.50    7.04
              .400    7.29 | 1.450  180.15 | 2.500   12.44 |  3.55    6.60
              .450    7.29 | 1.500  180.15 | 2.550   10.94 |  3.60    6.60
              .500    7.29 | 1.550   58.54 | 2.600   10.94 |  3.65    6.60
              .550    8.52 | 1.600   58.54 | 2.650   10.94 |  3.70    6.35
              .600    8.52 | 1.650   58.54 | 2.700   10.18 |  3.75    6.22
              .650    8.52 | 1.700   40.82 | 2.750    9.80 |  3.80    6.22
              .700    9.75 | 1.750   31.96 | 2.800    9.80 |  3.85    6.11
              .750   10.36 | 1.800   31.96 | 2.850    9.50 |  3.90    5.89
              .800   10.36 | 1.850   28.79 | 2.900    8.90 |  3.95    5.89
              .850   11.39 | 1.900   22.45 | 2.950    8.90 |  4.00    5.89
              .900   13.45 | 1.950   22.45 | 3.000    8.90 |  4.05    5.59
              .950   13.45 | 2.000   22.45 | 3.050    8.16 |  4.10    5.59
             1.000   13.45 | 2.050   17.52 | 3.100    8.16 |  4.15    5.59
             1.050   19.96 | 2.100   17.52 | 3.150    8.16 |

     Unit Hyd Qpeak  (cms)=    .348

     PEAK FLOW       (cms)=    .251 (i)
     TIME TO PEAK    (hrs)=   1.950
     RUNOFF VOLUME    (mm)=  35.315
     TOTAL RAINFALL   (mm)=  87.485
     RUNOFF COEFFICIENT   =    .404

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0100) |   Area    (ha)=   6.31   Curve Number   (CN)= 68.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .31

     Unit Hyd Qpeak  (cms)=    .777

     PEAK FLOW       (cms)=    .503 (i)
     TIME TO PEAK    (hrs)=   1.850
     RUNOFF VOLUME    (mm)=  35.314
     TOTAL RAINFALL   (mm)=  87.485
     RUNOFF COEFFICIENT   =    .404

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0400) |   Area    (ha)=  18.37   Curve Number   (CN)= 68.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.05

     Unit Hyd Qpeak  (cms)=    .668

     PEAK FLOW       (cms)=    .653 (i)
     TIME TO PEAK    (hrs)=   2.850
     RUNOFF VOLUME    (mm)=  35.315
     TOTAL RAINFALL   (mm)=  87.485
     RUNOFF COEFFICIENT   =    .404

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0201) |   Area    (ha)=   3.80   Curve Number   (CN)= 68.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .16

     Unit Hyd Qpeak  (cms)=    .907

     PEAK FLOW       (cms)=    .436 (i)
     TIME TO PEAK    (hrs)=   1.600
     RUNOFF VOLUME    (mm)=  35.293
     TOTAL RAINFALL   (mm)=  87.485
     RUNOFF COEFFICIENT   =    .403

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0101) |   Area    (ha)=   5.55   Curve Number   (CN)= 68.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=    .41

     Unit Hyd Qpeak  (cms)=    .517

     PEAK FLOW       (cms)=    .372 (i)
     TIME TO PEAK    (hrs)=   1.950
     RUNOFF VOLUME    (mm)=  35.315
     TOTAL RAINFALL   (mm)=  87.485
     RUNOFF COEFFICIENT   =    .404

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

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

--------------------
| ADD HYD   (0300) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0200):     3.74    .251     1.95    35.31
        + ID2= 2 (0100):     6.31    .503     1.85    35.31
          ==================================================
          ID = 3 (0300):    10.05    .743     1.85    35.31

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0500) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0300):    10.05    .743     1.85    35.31
        + ID2= 2 (0400):    18.37    .653     2.85    35.32
          ==================================================
          ID = 3 (0500):    28.42   1.077     2.05    35.31

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0301) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0201):     3.80    .436     1.60    35.29
        + ID2= 2 (0101):     5.55    .372     1.95    35.31
          ==================================================
          ID = 3 (0301):     9.35    .689     1.70    35.31

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

 FINISH
===========================================================================================================
```

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

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

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

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```
                   *****  S U M M A R Y   O U T P U T  *****

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: P:\Project Management\2012\12089.01 - Sean Mason, Essa Rd. Ph.2, Barrie\50 - Design Notes\12089.01 - OTTHYMO
- rev1\Pre
  Summary filename: P:\Project Management\2012\12089.01 - Sean Mason, Essa Rd. Ph.2, Barrie\50 - Design Notes\12089.01 - OTTHYMO
- rev1\Pre

DATE: 5/25/2016                            TIME: 15:15:17

USER:

COMMENTS: Pre Development - 24 Hour SCS Storm

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

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 15.0
      [ Ptot= 55.00 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\2yr_24hr_scs.stm
      remark: 24hr 2year SCS STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0400  1  3.0   18.37     .22 13.05  16.02  .29    .000
      [CN=68.0         ]
      [ N = 3.0:Tp 1.05]
*
  **  CALIB NASHYD       0100  1  3.0    6.31     .18 12.20  16.02  .29    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .31]
*
  **  CALIB NASHYD       0200  1  3.0    3.74     .09 12.30  16.02  .29    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0101  1  3.0    5.55     .13 12.30  16.02  .29    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0201  1  3.0    3.80     .16 12.05  16.01  .29    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0100 + 0200]  0300  3  3.0   10.05     .26 12.20  16.02  n/a    .000
*
      ADD [0101 + 0201]  0301  3  3.0    9.35     .26 12.10  16.02  n/a    .000
*
      ADD [0400 + 0300]  0500  3  3.0   28.42     .38 12.35  16.02  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 15.0
      [ Ptot= 76.00 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\5yr_24hr_scs.stm
      remark: 24hr 5year SCS STORM - CITY OF BARRIE
```

```
*
  **  CALIB NASHYD       0400  1  3.0   18.37     .39 13.05  27.99  .37    .000
      [CN=68.0         ]
      [ N = 3.0:Tp 1.05]
*
  **  CALIB NASHYD       0100  1  3.0    6.31     .32 12.20  27.99  .37    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .31]
*
  **  CALIB NASHYD       0200  1  3.0    3.74     .16 12.30  27.99  .37    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0101  1  3.0    5.55     .23 12.30  27.99  .37    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0201  1  3.0    3.80     .29 12.05  27.97  .37    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0100 + 0200]  0300  3  3.0   10.05     .47 12.20  27.99  n/a    .000
*
      ADD [0101 + 0201]  0301  3  3.0    9.35     .46 12.10  27.98  n/a    .000
*
      ADD [0400 + 0300]  0500  3  3.0   28.42     .68 12.35  27.99  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 15.0
      [ Ptot= 89.90 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\10yr_24hr_scs.stm
      remark: 24hr 10year SCS STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0400  1  3.0   18.37     .51 13.05  36.91  .41    .000
      [CN=68.0         ]
      [ N = 3.0:Tp 1.05]
*
  **  CALIB NASHYD       0100  1  3.0    6.31     .42 12.20  36.91  .41    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .31]
*
  **  CALIB NASHYD       0200  1  3.0    3.74     .21 12.30  36.91  .41    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0101  1  3.0    5.55     .31 12.30  36.91  .41    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0201  1  3.0    3.80     .38 12.05  36.89  .41    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0100 + 0200]  0300  3  3.0   10.05     .62 12.20  36.91  n/a    .000
*
      ADD [0101 + 0201]  0301  3  3.0    9.35     .61 12.10  36.91  n/a    .000
*
      ADD [0400 + 0300]  0500  3  3.0   28.42     .91 12.30  36.91  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 15.0
      [ Ptot=107.50 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\25yr_24hr_scs.stm
      remark: 24hr 25year SCS STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0400  1  3.0   18.37     .69 13.00  49.10  .46    .000
      [CN=68.0         ]
      [ N = 3.0:Tp 1.05]
*
  **  CALIB NASHYD       0100  1  3.0    6.31     .57 12.20  49.10  .46    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .31]
*
  **  CALIB NASHYD       0200  1  3.0    3.74     .28 12.30  49.10  .46    .000
```

```
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0101  1  3.0    5.55     .41 12.30  49.10  .46    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0201  1  3.0    3.80     .51 12.05  49.07  .46    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0100 + 0200]  0300  3  3.0   10.05     .83 12.20  49.10  n/a    .000
*
      ADD [0101 + 0201]  0301  3  3.0    9.35     .82 12.10  49.09  n/a    .000
*
      ADD [0400 + 0300]  0500  3  3.0   28.42    1.22 12.30  49.10  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 15.0
      [ Ptot=120.60 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\50yr_24hr_scs.stm
      remark: 24hr 50year SCS STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0400  1  3.0   18.37     .83 13.00  58.69  .49    .000
      [CN=68.0         ]
      [ N = 3.0:Tp 1.05]
*
  **  CALIB NASHYD       0100  1  3.0    6.31     .68 12.20  58.69  .49    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .31]
*
  **  CALIB NASHYD       0200  1  3.0    3.74     .33 12.30  58.69  .49    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0101  1  3.0    5.55     .49 12.30  58.69  .49    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .41]
*
  **  CALIB NASHYD       0201  1  3.0    3.80     .61 12.05  58.66  .49    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0100 + 0200]  0300  3  3.0   10.05    1.00 12.20  58.69  n/a    .000
*
      ADD [0101 + 0201]  0301  3  3.0    9.35     .98 12.10  58.68  n/a    .000
*
      ADD [0400 + 0300]  0500  3  3.0   28.42    1.46 12.30  58.69  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************


--------------------
|    READ STORM    |    Filename: P:\Design Aids\Storm\HYDROL
|                  |              OGY\StmFiles\City of Barrie - 2010\
|                  |              100yr_24hr_scs.stm
| Ptotal=133.60 mm |    Comments: 24hr 100year SCS STORM - CITY OF BARRIE
--------------------
                 TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                  .25    1.34 |  6.25    2.67 | 12.25   19.24 | 18.25    2.40
                  .50    1.34 |  6.50    2.67 | 12.50   19.24 | 18.50    2.40
                  .75    1.34 |  6.75    2.67 | 12.75    9.89 | 18.75    2.40
                 1.00    1.34 |  7.00    2.67 | 13.00    9.89 | 19.00    2.40
                 1.25    1.34 |  7.25    2.67 | 13.25    1.87 | 19.25    2.40
                 1.50    1.34 |  7.50    2.67 | 13.50    1.87 | 19.50    2.40
                 1.75    1.34 |  7.75    2.67 | 13.75   10.96 | 19.75    2.40
                 2.00    2.40 |  8.00    2.67 | 14.00   10.96 | 20.00    2.40
                 2.25    1.74 |  8.25    3.61 | 14.25    4.01 | 20.25    1.60
                 2.50    1.74 |  8.50    3.61 | 14.50    4.01 | 20.50    1.60
                 2.75    1.74 |  8.75    3.61 | 14.75    4.01 | 20.75    1.60
                 3.00    1.74 |  9.00    3.61 | 15.00    4.01 | 21.00    1.60
                 3.25    1.74 |  9.25    4.28 | 15.25    4.01 | 21.25    1.60
                 3.50    1.74 |  9.50    4.28 | 15.50    4.01 | 21.50    1.60
                 3.75    1.74 |  9.75    4.81 | 15.75    4.01 | 21.75    1.60
                 4.00    1.74 | 10.00    4.81 | 16.00    4.01 | 22.00    1.60
                 4.25    2.14 | 10.25    6.15 | 16.25    2.40 | 22.25    1.60
                 4.50    2.14 | 10.50    6.15 | 16.50    2.40 | 22.50    1.60
                 4.75    2.14 | 10.75    8.28 | 16.75    2.40 | 22.75    1.60
                 5.00    2.14 | 11.00    8.28 | 17.00    2.40 | 23.00    1.60
```

5.25	2.14	11.25	12.83	17.25	2.40	23.25	1.60
5.50	2.14	11.50	12.83	17.50	2.40	23.50	1.60
5.75	2.14	11.75	55.58	17.75	2.40	23.75	1.60
6.00	2.14	12.00	147.49	18.00	2.40	24.00	1.60

```
--------------------
| CALIB              |
| NASHYD    (0400) |   Area     (ha)=  18.37   Curve Number   (CN)= 68.0
|ID= 1 DT= 3.0 min |   Ia       (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.05
```

NOTE: RAINFALL WAS TRANSFORMED TO 3.0 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
.050	1.34	6.050	2.67	12.050	19.24	18.05	2.40
.100	1.34	6.100	2.67	12.100	19.24	18.10	2.40
.150	1.34	6.150	2.67	12.150	19.24	18.15	2.40
.200	1.34	6.200	2.67	12.200	19.24	18.20	2.40
.250	1.34	6.250	2.67	12.250	19.24	18.25	2.40
.300	1.34	6.300	2.67	12.300	19.24	18.30	2.40
.350	1.34	6.350	2.67	12.350	19.24	18.35	2.40
.400	1.34	6.400	2.67	12.400	19.24	18.40	2.40
.450	1.34	6.450	2.67	12.450	19.24	18.45	2.40
.500	1.34	6.500	2.67	12.500	19.23	18.50	2.40
.550	1.34	6.550	2.67	12.550	9.89	18.55	2.40
.600	1.34	6.600	2.67	12.600	9.89	18.60	2.40
.650	1.34	6.650	2.67	12.650	9.89	18.65	2.40
.700	1.34	6.700	2.67	12.700	9.89	18.70	2.40
.750	1.34	6.750	2.67	12.750	9.89	18.75	2.40
.800	1.34	6.800	2.67	12.800	9.89	18.80	2.40
.850	1.34	6.850	2.67	12.850	9.89	18.85	2.40
.900	1.34	6.900	2.67	12.900	9.89	18.90	2.40
.950	1.34	6.950	2.67	12.950	9.89	18.95	2.40
1.000	1.34	7.000	2.67	13.000	9.88	19.00	2.40
1.050	1.34	7.050	2.67	13.050	1.87	19.05	2.40
1.100	1.34	7.100	2.67	13.100	1.87	19.10	2.40
1.150	1.34	7.150	2.67	13.150	1.87	19.15	2.40
1.200	1.34	7.200	2.67	13.200	1.87	19.20	2.40
1.250	1.34	7.250	2.67	13.250	1.87	19.25	2.40
1.300	1.34	7.300	2.67	13.300	1.87	19.30	2.40
1.350	1.34	7.350	2.67	13.350	1.87	19.35	2.40
1.400	1.34	7.400	2.67	13.400	1.87	19.40	2.40
1.450	1.34	7.450	2.67	13.450	1.87	19.45	2.40
1.500	1.34	7.500	2.67	13.500	1.88	19.50	2.40
1.550	1.34	7.550	2.67	13.550	10.96	19.55	2.40
1.600	1.34	7.600	2.67	13.600	10.96	19.60	2.40
1.650	1.34	7.650	2.67	13.650	10.96	19.65	2.40
1.700	1.34	7.700	2.67	13.700	10.96	19.70	2.40
1.750	1.34	7.750	2.67	13.750	10.96	19.75	2.40
1.800	2.40	7.800	2.67	13.800	10.96	19.80	2.40
1.850	2.40	7.850	2.67	13.850	10.96	19.85	2.40
1.900	2.40	7.900	2.67	13.900	10.96	19.90	2.40
1.950	2.40	7.950	2.67	13.950	10.96	19.95	2.40
2.000	2.40	8.000	2.67	14.000	10.95	20.00	2.40
2.050	1.74	8.050	3.61	14.050	4.01	20.05	1.60
2.100	1.74	8.100	3.61	14.100	4.01	20.10	1.60
2.150	1.74	8.150	3.61	14.150	4.01	20.15	1.60
2.200	1.74	8.200	3.61	14.200	4.01	20.20	1.60
2.250	1.74	8.250	3.61	14.250	4.01	20.25	1.60
2.300	1.74	8.300	3.61	14.300	4.01	20.30	1.60
2.350	1.74	8.350	3.61	14.350	4.01	20.35	1.60
2.400	1.74	8.400	3.61	14.400	4.01	20.40	1.60
2.450	1.74	8.450	3.61	14.450	4.01	20.45	1.60
2.500	1.74	8.500	3.61	14.500	4.01	20.50	1.60
2.550	1.74	8.550	3.61	14.550	4.01	20.55	1.60
2.600	1.74	8.600	3.61	14.600	4.01	20.60	1.60
2.650	1.74	8.650	3.61	14.650	4.01	20.65	1.60
2.700	1.74	8.700	3.61	14.700	4.01	20.70	1.60
2.750	1.74	8.750	3.61	14.750	4.01	20.75	1.60
2.800	1.74	8.800	3.61	14.800	4.01	20.80	1.60
2.850	1.74	8.850	3.61	14.850	4.01	20.85	1.60
2.900	1.74	8.900	3.61	14.900	4.01	20.90	1.60
2.950	1.74	8.950	3.61	14.950	4.01	20.95	1.60
3.000	1.74	9.000	3.61	15.000	4.01	21.00	1.60
3.050	1.74	9.050	4.28	15.050	4.01	21.05	1.60
3.100	1.74	9.100	4.28	15.100	4.01	21.10	1.60
3.150	1.74	9.150	4.28	15.150	4.01	21.15	1.60
3.200	1.74	9.200	4.28	15.200	4.01	21.20	1.60
3.250	1.74	9.250	4.28	15.250	4.01	21.25	1.60
3.300	1.74	9.300	4.28	15.300	4.01	21.30	1.60
3.350	1.74	9.350	4.28	15.350	4.01	21.35	1.60
3.400	1.74	9.400	4.28	15.400	4.01	21.40	1.60
3.450	1.74	9.450	4.28	15.450	4.01	21.45	1.60
3.500	1.74	9.500	4.28	15.500	4.01	21.50	1.60
3.550	1.74	9.550	4.81	15.550	4.01	21.55	1.60

```
             3.600    1.74 | 9.600    4.81 |15.600    4.01 | 21.60    1.60
             3.650    1.74 | 9.650    4.81 |15.650    4.01 | 21.65    1.60
             3.700    1.74 | 9.700    4.81 |15.700    4.01 | 21.70    1.60
             3.750    1.74 | 9.750    4.81 |15.750    4.01 | 21.75    1.60
             3.800    1.74 | 9.800    4.81 |15.800    4.01 | 21.80    1.60
             3.850    1.74 | 9.850    4.81 |15.850    4.01 | 21.85    1.60
             3.900    1.74 | 9.900    4.81 |15.900    4.01 | 21.90    1.60
             3.950    1.74 | 9.950    4.81 |15.950    4.01 | 21.95    1.60
             4.000    1.74 |10.000    4.81 |16.000    4.01 | 22.00    1.60
             4.050    2.14 |10.050    6.15 |16.050    2.40 | 22.05    1.60
             4.100    2.14 |10.100    6.15 |16.100    2.40 | 22.10    1.60
             4.150    2.14 |10.150    6.15 |16.150    2.40 | 22.15    1.60
             4.200    2.14 |10.200    6.15 |16.200    2.40 | 22.20    1.60
             4.250    2.14 |10.250    6.15 |16.250    2.40 | 22.25    1.60
             4.300    2.14 |10.300    6.15 |16.300    2.40 | 22.30    1.60
             4.350    2.14 |10.350    6.15 |16.350    2.40 | 22.35    1.60
             4.400    2.14 |10.400    6.15 |16.400    2.40 | 22.40    1.60
             4.450    2.14 |10.450    6.15 |16.450    2.40 | 22.45    1.60
             4.500    2.14 |10.500    6.15 |16.500    2.40 | 22.50    1.60
             4.550    2.14 |10.550    8.28 |16.550    2.40 | 22.55    1.60
             4.600    2.14 |10.600    8.28 |16.600    2.40 | 22.60    1.60
             4.650    2.14 |10.650    8.28 |16.650    2.40 | 22.65    1.60
             4.700    2.14 |10.700    8.28 |16.700    2.40 | 22.70    1.60
             4.750    2.14 |10.750    8.28 |16.750    2.40 | 22.75    1.60
             4.800    2.14 |10.800    8.28 |16.800    2.40 | 22.80    1.60
             4.850    2.14 |10.850    8.28 |16.850    2.40 | 22.85    1.60
             4.900    2.14 |10.900    8.28 |16.900    2.40 | 22.90    1.60
             4.950    2.14 |10.950    8.28 |16.950    2.40 | 22.95    1.60
             5.000    2.14 |11.000    8.29 |17.000    2.40 | 23.00    1.60
             5.050    2.14 |11.050   12.83 |17.050    2.40 | 23.05    1.60
             5.100    2.14 |11.100   12.83 |17.100    2.40 | 23.10    1.60
             5.150    2.14 |11.150   12.83 |17.150    2.40 | 23.15    1.60
             5.200    2.14 |11.200   12.83 |17.200    2.40 | 23.20    1.60
             5.250    2.14 |11.250   12.83 |17.250    2.40 | 23.25    1.60
             5.300    2.14 |11.300   12.83 |17.300    2.40 | 23.30    1.60
             5.350    2.14 |11.350   12.83 |17.350    2.40 | 23.35    1.60
             5.400    2.14 |11.400   12.83 |17.400    2.40 | 23.40    1.60
             5.450    2.14 |11.450   12.83 |17.450    2.40 | 23.45    1.60
             5.500    2.14 |11.500   12.85 |17.500    2.40 | 23.50    1.60
             5.550    2.14 |11.550   55.58 |17.550    2.40 | 23.55    1.60
             5.600    2.14 |11.600   55.58 |17.600    2.40 | 23.60    1.60
             5.650    2.14 |11.650   55.58 |17.650    2.40 | 23.65    1.60
             5.700    2.14 |11.700   55.58 |17.700    2.40 | 23.70    1.60
             5.750    2.14 |11.750   55.63 |17.750    2.40 | 23.75    1.60
             5.800    2.14 |11.800  147.49 |17.800    2.40 | 23.80    1.60
             5.850    2.14 |11.850  147.49 |17.850    2.40 | 23.85    1.60
             5.900    2.14 |11.900  147.49 |17.900    2.40 | 23.90    1.60
             5.950    2.14 |11.950  147.49 |17.950    2.40 | 23.95    1.60
             6.000    2.14 |12.000  147.42 |18.000    2.40 | 24.00    1.60

     Unit Hyd Qpeak  (cms)=    .668

     PEAK FLOW       (cms)=    .970 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)=  68.576
     TOTAL RAINFALL   (mm)= 133.600
     RUNOFF COEFFICIENT   =    .513

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0100) |   Area    (ha)=   6.31   Curve Number   (CN)= 68.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .31

     Unit Hyd Qpeak  (cms)=    .777

     PEAK FLOW       (cms)=    .796 (i)
     TIME TO PEAK    (hrs)=  12.200
     RUNOFF VOLUME    (mm)=  68.573
     TOTAL RAINFALL   (mm)= 133.600
     RUNOFF COEFFICIENT   =    .513

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0200) |   Area    (ha)=   3.74   Curve Number   (CN)= 68.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .41

     Unit Hyd Qpeak  (cms)=    .348

     PEAK FLOW       (cms)=    .389 (i)
     TIME TO PEAK    (hrs)=  12.300
     RUNOFF VOLUME    (mm)=  68.575
     TOTAL RAINFALL   (mm)= 133.600
```

```
     RUNOFF COEFFICIENT   =    .513

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0101) |   Area    (ha)=   5.55   Curve Number   (CN)= 68.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .41

     Unit Hyd Qpeak  (cms)=    .517

     PEAK FLOW       (cms)=    .578 (i)
     TIME TO PEAK    (hrs)=  12.300
     RUNOFF VOLUME    (mm)=  68.575
     TOTAL RAINFALL   (mm)= 133.600
     RUNOFF COEFFICIENT   =    .513

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0201) |   Area    (ha)=   3.80   Curve Number   (CN)= 68.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .16

     Unit Hyd Qpeak  (cms)=    .907

     PEAK FLOW       (cms)=    .718 (i)
     TIME TO PEAK    (hrs)=  12.050
     RUNOFF VOLUME    (mm)=  68.534
     TOTAL RAINFALL   (mm)= 133.600
     RUNOFF COEFFICIENT   =    .513

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

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

--------------------
| ADD HYD   (0300) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0100):     6.31    .796    12.20    68.57
        + ID2= 2 (0200):     3.74    .389    12.30    68.57
          ===============================================
          ID = 3 (0300):    10.05   1.175    12.20    68.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0301) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0101):     5.55    .578    12.30    68.57
        + ID2= 2 (0201):     3.80    .718    12.05    68.53
          ===============================================
          ID = 3 (0301):     9.35   1.153    12.10    68.56

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0500) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0400):    18.37    .970    13.00    68.58
        + ID2= 2 (0300):    10.05   1.175    12.20    68.57
          ===============================================
          ID = 3 (0500):    28.42   1.718    12.30    68.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

 FINISH
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================================================================================================================

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

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

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

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: C:\Users\tarkell\Desktop\12089~1.01-\Pre - Regional.out
  Summary filename: C:\Users\tarkell\Desktop\12089~1.01-\Pre - Regional.sum
```

DATE: 2/21/2017   TIME: 14:47:57

USER:

COMMENTS: Pre Development – Regional Storm Hazel

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


--------------------
|    READ STORM    |    Filename: C:\Users\tarkell\Desktop
|                  |              \StmFiles\hazel-hr.stm
| Ptotal=212.00 mm |    Comments: Hurricane Hazel for the last 12 hrs of t
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
1.00	6.00	4.00	13.00	7.00	23.00	10.00	53.00
2.00	4.00	5.00	17.00	8.00	13.00	11.00	38.00
3.00	6.00	6.00	13.00	9.00	13.00	12.00	13.00

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

--------------------
| CALIB            |
| NASHYD    (0200) |   Area    (ha)=   3.74   Curve Number   (CN)= 83.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .41

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.
```

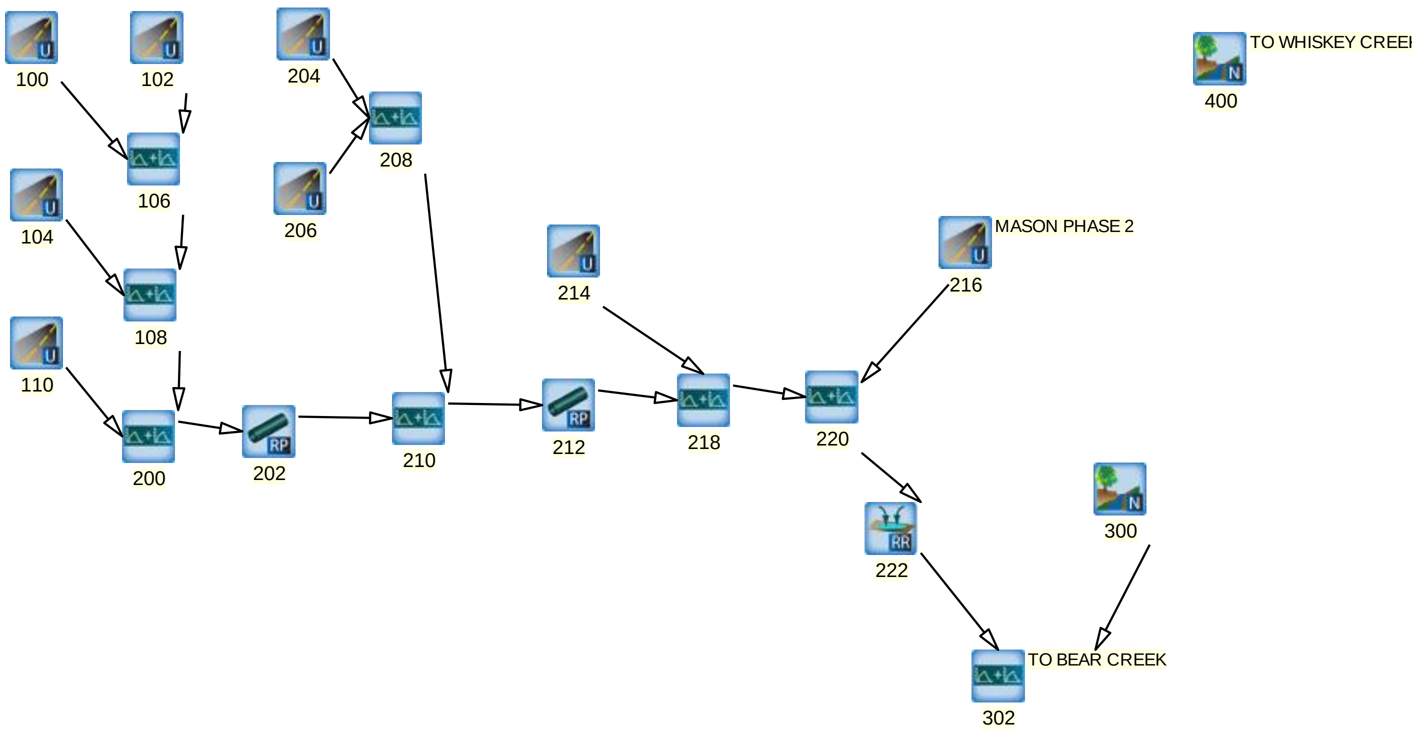
---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.050	6.00	3.050	13.00	6.050	23.00	9.05	53.00
.100	6.00	3.100	13.00	6.100	23.00	9.10	53.00
.150	6.00	3.150	13.00	6.150	23.00	9.15	53.00
.200	6.00	3.200	13.00	6.200	23.00	9.20	53.00
.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
.300	6.00	3.300	13.00	6.300	23.00	9.30	53.00
.350	6.00	3.350	13.00	6.350	23.00	9.35	53.00
.400	6.00	3.400	13.00	6.400	23.00	9.40	53.00
.450	6.00	3.450	13.00	6.450	23.00	9.45	53.00
.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
.550	6.00	3.550	13.00	6.550	23.00	9.55	53.00
.600	6.00	3.600	13.00	6.600	23.00	9.60	53.00
.650	6.00	3.650	13.00	6.650	23.00	9.65	53.00
.700	6.00	3.700	13.00	6.700	23.00	9.70	53.00
.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
.800	6.00	3.800	13.00	6.800	23.00	9.80	53.00
.850	6.00	3.850	13.00	6.850	23.00	9.85	53.00
.900	6.00	3.900	13.00	6.900	23.00	9.90	53.00
.950	6.00	3.950	13.00	6.950	23.00	9.95	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	52.99
1.050	4.00	4.050	17.00	7.050	13.00	10.05	38.00
1.100	4.00	4.100	17.00	7.100	13.00	10.10	38.00
1.150	4.00	4.150	17.00	7.150	13.00	10.15	38.00
1.200	4.00	4.200	17.00	7.200	13.00	10.20	38.00

1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.300	4.00	4.300	17.00	7.300	13.00	10.30	38.00
1.350	4.00	4.350	17.00	7.350	13.00	10.35	38.00
1.400	4.00	4.400	17.00	7.400	13.00	10.40	38.00
1.450	4.00	4.450	17.00	7.450	13.00	10.45	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.550	4.00	4.550	17.00	7.550	13.00	10.55	38.00
1.600	4.00	4.600	17.00	7.600	13.00	10.60	38.00
1.650	4.00	4.650	17.00	7.650	13.00	10.65	38.00
1.700	4.00	4.700	17.00	7.700	13.00	10.70	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.800	4.00	4.800	17.00	7.800	13.00	10.80	38.00
1.850	4.00	4.850	17.00	7.850	13.00	10.85	38.00
1.900	4.00	4.900	17.00	7.900	13.00	10.90	38.00
1.950	4.00	4.950	17.00	7.950	13.00	10.95	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	37.99
2.050	6.00	5.050	13.00	8.050	13.00	11.05	13.00
2.100	6.00	5.100	13.00	8.100	13.00	11.10	13.00
2.150	6.00	5.150	13.00	8.150	13.00	11.15	13.00
2.200	6.00	5.200	13.00	8.200	13.00	11.20	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.300	6.00	5.300	13.00	8.300	13.00	11.30	13.00
2.350	6.00	5.350	13.00	8.350	13.00	11.35	13.00
2.400	6.00	5.400	13.00	8.400	13.00	11.40	13.00
2.450	6.00	5.450	13.00	8.450	13.00	11.45	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.550	6.00	5.550	13.00	8.550	13.00	11.55	13.00
2.600	6.00	5.600	13.00	8.600	13.00	11.60	13.00
2.650	6.00	5.650	13.00	8.650	13.00	11.65	13.00
2.700	6.00	5.700	13.00	8.700	13.00	11.70	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.800	6.00	5.800	13.00	8.800	13.00	11.80	13.00
2.850	6.00	5.850	13.00	8.850	13.00	11.85	13.00
2.900	6.00	5.900	13.00	8.900	13.00	11.90	13.00
2.950	6.00	5.950	13.00	8.950	13.00	11.95	13.00
3.000	6.00	6.000	13.00	9.000	13.01	12.00	12.99

```
     Unit Hyd Qpeak  (cms)=    .348

     PEAK FLOW       (cms)=    .472 (i)
     TIME TO PEAK    (hrs)=  10.150
     RUNOFF VOLUME    (mm)= 167.822
     TOTAL RAINFALL   (mm)= 211.999
     RUNOFF COEFFICIENT   =    .792

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0100) |   Area    (ha)=   6.31   Curve Number   (CN)= 83.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .31

     Unit Hyd Qpeak  (cms)=    .777

     PEAK FLOW       (cms)=    .836 (i)
     TIME TO PEAK    (hrs)=  10.050
     RUNOFF VOLUME    (mm)= 167.817
     TOTAL RAINFALL   (mm)= 211.999
     RUNOFF COEFFICIENT   =    .792

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0400) |   Area    (ha)=  18.37   Curve Number   (CN)= 83.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.05

     Unit Hyd Qpeak  (cms)=    .668

     PEAK FLOW       (cms)=   1.821 (i)
     TIME TO PEAK    (hrs)=  11.200
     RUNOFF VOLUME    (mm)= 167.824
     TOTAL RAINFALL   (mm)= 211.999
     RUNOFF COEFFICIENT   =    .792

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0201) |   Area    (ha)=   3.80   Curve Number   (CN)= 83.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .16

     Unit Hyd Qpeak  (cms)=    .907
```

```
     PEAK FLOW       (cms)=    .521 (i)
     TIME TO PEAK    (hrs)=  10.000
     RUNOFF VOLUME    (mm)= 167.721
     TOTAL RAINFALL   (mm)= 211.999
     RUNOFF COEFFICIENT   =    .791

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0101) |   Area    (ha)=   5.55   Curve Number   (CN)= 83.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .41

     Unit Hyd Qpeak  (cms)=    .517

     PEAK FLOW       (cms)=    .700 (i)
     TIME TO PEAK    (hrs)=  10.150
     RUNOFF VOLUME    (mm)= 167.822
     TOTAL RAINFALL   (mm)= 211.999
     RUNOFF COEFFICIENT   =    .792

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

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

--------------------
| ADD HYD   (0300) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0200):     3.74    .472    10.15   167.82
        + ID2= 2 (0100):     6.31    .836    10.05   167.82
          ===============================================
          ID = 3 (0300):    10.05   1.303    10.10   167.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0500) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0300):    10.05   1.303    10.10   167.82
        + ID2= 2 (0400):    18.37   1.821    11.20   167.82
          ===============================================
          ID = 3 (0500):    28.42   2.828    11.05   167.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0301) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0201):     3.80    .521    10.00   167.72
        + ID2= 2 (0101):     5.55    .700    10.15   167.82
          ===============================================
          ID = 3 (0301):     9.35   1.203    10.05   167.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

 FINISH
===========================================================================================================
```



POST DEVELOPMENT OTTHYMO SCHEMATIC

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

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

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

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```
                   *****  S U M M A R Y   O U T P U T  *****

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: P:\Project Management\2012\12089.01 - Sean Mason, Essa Rd. Ph.2, Barrie\50 - Design Notes\12089.01 - OTTHYMO
- rev1\Post
  Summary filename: P:\Project Management\2012\12089.01 - Sean Mason, Essa Rd. Ph.2, Barrie\50 - Design Notes\12089.01 - OTTHYMO
- rev1\Post


DATE: 5/25/2016                            TIME: 15:38:15

USER:


COMMENTS: Post Development - 4 Hour Chicago Storm & 25 mm Storm


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

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 10.0
      [ Ptot= 36.95 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\2yr_4hr_chi.stm
      remark: 4hr 2year CHICAGO STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0300  1 10.0    3.35     .08  1.50   7.27  .20    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  *   CALIB STANDHYD     0214  1 10.0    6.94     .40  1.50  12.05  .33    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0206  1 10.0   12.07     .68  1.50  12.05  .33    .000
      [I%=30.0:S%= 1.00]
*
  *   CALIB STANDHYD     0204  1 10.0    3.90     .26  1.50  12.05  .33    .000
      [I%=30.0:S%= 1.90]
*
  *   CALIB STANDHYD     0104  1 10.0    3.83     .24  1.50  12.04  .33    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0102  1 10.0    2.08     .14  1.50  12.04  .33    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0100  1 10.0    1.97     .07  1.50   8.65  .23    .000
      [I%=20.0:S%=  .30]
*
  *   CALIB STANDHYD     0110  1 10.0     .74     .05  1.50  12.01  .32    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0216  1 10.0     .98     .14  1.50  22.41  .61    .000
      [I%=61.0:S%= 1.50]
*
  *   CALIB NASHYD       0400  1 10.0    1.71     .04  1.50   7.81  .21    .000
      [CN=70.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0206 + 0204]  0208  3 10.0   15.97     .94  1.50  12.05  n/a    .000
*
      ADD [0102 + 0100]  0106  3 10.0    4.05     .21  1.50  10.39  n/a    .000
*
      ADD [0104 + 0106]  0108  3 10.0    7.88     .45  1.50  11.19  n/a    .000
*
      ADD [0108 + 0110]  0200  3 10.0    8.62     .50  1.50  11.26  n/a    .000
```

```
*
     PIPE   [ 2 : 0200] 0202  1 10.0    8.62     .37  1.67  11.26  n/a    .000
*
     ADD [0208 + 0202]  0210  3 10.0   24.59    1.23  1.50  11.77  n/a    .000
*
     PIPE   [ 2 : 0210] 0212  1 10.0   24.59    1.12  1.67  11.77  n/a    .000
*
     ADD [0214 + 0212]  0218  3 10.0   31.53    1.32  1.67  11.83  n/a    .000
*
     ADD [0218 + 0216]  0220  3 10.0   32.51    1.43  1.50  12.15  n/a    .000
*
     RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .10  3.83  12.15  n/a    .000
     {ST=   .27 ha.m }
*
     ADD [0300 + 0222]  0302  3 10.0   35.86     .15  1.67  11.69  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

     START @   .00 hrs
     --------------------
     READ STORM                 10.0
     [ Ptot= 50.52 mm ]
     fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\5yr_4hr_chi.stm
     remark: 4hr 5year CHICAGO STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0300  1 10.0    3.35     .14  1.50  12.98  .26    .000
     [CN=68.0        ]
     [ N = 3.0:Tp  .16]
*
  *   CALIB STANDHYD     0214  1 10.0    6.94     .55  1.50  19.68  .39    .000
     [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0206  1 10.0   12.07     .93  1.50  19.69  .39    .000
     [I%=30.0:S%= 1.00]
*
  *   CALIB STANDHYD     0204  1 10.0    3.90     .35  1.50  19.69  .39    .000
     [I%=30.0:S%= 1.90]
*
  *   CALIB STANDHYD     0104  1 10.0    3.83     .33  1.50  19.68  .39    .000
     [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0102  1 10.0    2.08     .19  1.50  19.68  .39    .000
     [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0100  1 10.0    1.97     .09  1.50  15.47  .31    .000
     [I%=20.0:S%=  .30]
*
  *   CALIB STANDHYD     0110  1 10.0     .74     .07  1.50  19.67  .39    .000
     [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0216  1 10.0     .98     .19  1.50  32.68  .65    .000
     [I%=61.0:S%= 1.50]
*
  *   CALIB NASHYD       0400  1 10.0    1.71     .08  1.50  13.87  .27    .000
     [CN=70.0        ]
     [ N = 3.0:Tp  .16]
*
     ADD [0206 + 0204]  0208  3 10.0   15.97    1.28  1.50  19.69  n/a    .000
*
     ADD [0102 + 0100]  0106  3 10.0    4.05     .28  1.50  17.63  n/a    .000
*
     ADD [0104 + 0106]  0108  3 10.0    7.88     .61  1.50  18.63  n/a    .000
*
     ADD [0108 + 0110]  0200  3 10.0    8.62     .68  1.50  18.72  n/a    .000
*
     PIPE   [ 2 : 0200] 0202  1 10.0    8.62     .51  1.67  18.72  n/a    .000
*
     ADD [0208 + 0202]  0210  3 10.0   24.59    1.70  1.50  19.35  n/a    .000
*
     PIPE   [ 2 : 0210] 0212  1 10.0   24.59    1.52  1.67  19.35  n/a    .000
*
     ADD [0214 + 0212]  0218  3 10.0   31.53    1.80  1.50  19.42  n/a    .000
*
     ADD [0218 + 0216]  0220  3 10.0   32.51    1.99  1.50  19.82  n/a    .000
*
     RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .11  4.33  19.82  n/a    .000
     {ST=   .48 ha.m }
*
     ADD [0300 + 0222]  0302  3 10.0   35.86     .22  1.67  19.18  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
```

```
                              min     ha     cms   hrs     mm           cms

    START @   .00 hrs
    --------------------
    READ STORM                 10.0
    [ Ptot= 59.69 mm ]
    fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\10yr_4hr_chi.stm
    remark: 4hr 10year CHICAGO STORM - CITY OF BARRIE
*
 ** CALIB NASHYD       0300  1 10.0    3.35     .19  1.50  17.46  .29    .000
    [CN=68.0         ]
    [ N = 3.0:Tp  .16]
*
 *  CALIB STANDHYD     0214  1 10.0    6.94     .65  1.50  25.66  .43    .000
    [I%=30.0:S%=  .50]
*
 *  CALIB STANDHYD     0206  1 10.0   12.07    1.11  1.50  25.66  .43    .000
    [I%=30.0:S%= 1.00]
*
 *  CALIB STANDHYD     0204  1 10.0    3.90     .42  1.50  25.66  .43    .000
    [I%=30.0:S%= 1.90]
*
 *  CALIB STANDHYD     0104  1 10.0    3.83     .38  1.50  25.66  .43    .000
    [I%=30.0:S%=  .70]
*
 *  CALIB STANDHYD     0102  1 10.0    2.08     .23  1.50  25.65  .43    .000
    [I%=30.0:S%=  .70]
*
 *  CALIB STANDHYD     0100  1 10.0    1.97     .11  1.50  20.99  .35    .000
    [I%=20.0:S%=  .30]
*
 *  CALIB STANDHYD     0110  1 10.0     .74     .09  1.50  25.66  .43    .000
    [I%=30.0:S%=  .50]
*
 *  CALIB STANDHYD     0216  1 10.0     .98     .22  1.50  40.07  .67    .000
    [I%=61.0:S%= 1.50]
*
 *  CALIB NASHYD       0400  1 10.0    1.71     .10  1.50  18.58  .31    .000
    [CN=70.0         ]
    [ N = 3.0:Tp  .16]
*
    ADD [0206 + 0204]  0208  3 10.0   15.97    1.53  1.50  25.66  n/a    .000
*
    ADD [0102 + 0100]  0106  3 10.0    4.05     .34  1.50  23.38  n/a    .000
*
    ADD [0104 + 0106]  0108  3 10.0    7.88     .72  1.50  24.49  n/a    .000
*
    ADD [0108 + 0110]  0200  3 10.0    8.62     .81  1.50  24.59  n/a    .000
*
    PIPE   [ 2 : 0200] 0202  1 10.0    8.62     .63  1.67  24.59  n/a    .000
*
    ADD [0208 + 0202]  0210  3 10.0   24.59    2.03  1.50  25.28  n/a    .000
*
    PIPE   [ 2 : 0210] 0212  1 10.0   24.59    1.83  1.67  25.28  n/a    .000
*
    ADD [0214 + 0212]  0218  3 10.0   31.53    2.17  1.50  25.37  n/a    .000
*
    ADD [0218 + 0216]  0220  3 10.0   32.51    2.39  1.50  25.81  n/a    .000
*
    RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .28  3.67  25.80  n/a    .000
    {ST=   .60 ha.m }
*
    ADD [0300 + 0222]  0302  3 10.0   35.86     .30  3.67  25.02  n/a    .000
*
 ****************************
 ** SIMULATION NUMBER:   4 **
 ****************************

 W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                              min     ha     cms   hrs     mm           cms

    START @   .00 hrs
    --------------------
    READ STORM                 10.0
    [ Ptot= 71.24 mm ]
    fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\25yr_4hr_chi.stm
    remark: 4hr 25year CHICAGO STORM - CITY OF BARRIE
*
 ** CALIB NASHYD       0300  1 10.0    3.35     .25  1.50  23.67  .33    .000
    [CN=68.0         ]
    [ N = 3.0:Tp  .16]
*
 *  CALIB STANDHYD     0214  1 10.0    6.94     .78  1.50  33.33  .47    .000
    [I%=30.0:S%=  .50]
*
 *  CALIB STANDHYD     0206  1 10.0   12.07    1.33  1.50  33.33  .47    .000
    [I%=30.0:S%= 1.00]
*
 *  CALIB STANDHYD     0204  1 10.0    3.90     .52  1.50  33.33  .47    .000
    [I%=30.0:S%= 1.90]
```

```
*
  *   CALIB STANDHYD     0104  1 10.0    3.83     .46  1.50  33.33  .47    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0102  1 10.0    2.08     .28  1.50  33.33  .47    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0100  1 10.0    1.97     .14  1.50  28.11  .39    .000
      [I%=20.0:S%=  .30]
*
  *   CALIB STANDHYD     0110  1 10.0     .74     .11  1.50  33.33  .47    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0216  1 10.0     .98     .27  1.50  49.45  .69    .000
      [I%=61.0:S%= 1.50]
*
  *   CALIB NASHYD       0400  1 10.0    1.71     .14  1.50  25.10  .35    .000
      [CN=70.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0206 + 0204]  0208  3 10.0   15.97    1.85  1.50  33.33  n/a    .000
*
      ADD [0102 + 0100]  0106  3 10.0    4.05     .42  1.50  30.79  n/a    .000
*
      ADD [0104 + 0106]  0108  3 10.0    7.88     .88  1.50  32.02  n/a    .000
*
      ADD [0108 + 0110]  0200  3 10.0    8.62     .99  1.50  32.13  n/a    .000
*
      PIPE   [ 2 : 0200] 0202  1 10.0    8.62     .81  1.67  32.13  n/a    .000
*
      ADD [0208 + 0202]  0210  3 10.0   24.59    2.47  1.50  32.91  n/a    .000
*
      PIPE   [ 2 : 0210] 0212  1 10.0   24.59    2.28  1.67  32.91  n/a    .000
*
      ADD [0214 + 0212]  0218  3 10.0   31.53    2.66  1.50  33.00  n/a    .000
*
      ADD [0218 + 0216]  0220  3 10.0   32.51    2.92  1.50  33.50  n/a    .000
*
      RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .41  3.50  33.49  n/a    .000
      {ST=   .72 ha.m }
*
      ADD [0300 + 0222]  0302  3 10.0   35.86     .44  3.33  32.58  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 10.0
      [ Ptot= 79.45 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\50yr_4hr_chi.stm
      remark: 4hr 50year CHICAGO STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0300  1 10.0    3.35     .31  1.50  28.43  .36    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  *   CALIB STANDHYD     0214  1 10.0    6.94     .88  1.50  39.08  .49    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0206  1 10.0   12.07    1.50  1.50  39.08  .49    .000
      [I%=30.0:S%= 1.00]
*
  *   CALIB STANDHYD     0204  1 10.0    3.90     .59  1.50  39.08  .49    .000
      [I%=30.0:S%= 1.90]
*
  *   CALIB STANDHYD     0104  1 10.0    3.83     .52  1.50  39.08  .49    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0102  1 10.0    2.08     .32  1.50  39.08  .49    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0100  1 10.0    1.97     .15  1.50  33.51  .42    .000
      [I%=20.0:S%=  .30]
*
  *   CALIB STANDHYD     0110  1 10.0     .74     .13  1.50  39.08  .49    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0216  1 10.0     .98     .34  1.50  56.30  .71    .000
      [I%=61.0:S%= 1.50]
*
  *   CALIB NASHYD       0400  1 10.0    1.71     .17  1.50  30.07  .38    .000
      [CN=70.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0206 + 0204]  0208  3 10.0   15.97    2.08  1.50  39.08  n/a    .000
```

```
*
     ADD [0102 + 0100]  0106  3 10.0    4.05     .47  1.50  36.37  n/a    .000
*
     ADD [0104 + 0106]  0108  3 10.0    7.88     .99  1.50  37.68  n/a    .000
*
     ADD [0108 + 0110]  0200  3 10.0    8.62    1.12  1.50  37.80  n/a    .000
*
     PIPE   [ 2 : 0200] 0202  1 10.0    8.62     .93  1.67  37.80  n/a    .000
*
     ADD [0208 + 0202]  0210  3 10.0   24.59    2.80  1.50  38.63  n/a    .000
*
     PIPE   [ 2 : 0210] 0212  1 10.0   24.59    2.59  1.67  38.63  n/a    .000
*
     ADD [0214 + 0212]  0218  3 10.0   31.53    3.01  1.67  38.73  n/a    .000
*
     ADD [0218 + 0216]  0220  3 10.0   32.51    3.35  1.50  39.26  n/a    .000
*
     RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .51  3.33  39.25  n/a    .000
     {ST=   .83 ha.m }
*
     ADD [0300 + 0222]  0302  3 10.0   35.86     .55  3.33  38.24  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

     START @   .00 hrs
     --------------------
     READ STORM                 10.0
     [ Ptot= 87.58 mm ]
     fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\100yr_4hr_chi.stm
     remark: 4hr 100year CHICAGO STORM - CITY OF BARRIE
*
  ** CALIB NASHYD       0300  1 10.0    3.35     .37  1.50  33.37  .38    .000
     [CN=68.0         ]
     [ N = 3.0:Tp  .16]
*
  *  CALIB STANDHYD     0214  1 10.0    6.94     .98  1.50  45.75  .52    .000
     [I%=30.0:S%=  .50]
*
  *  CALIB STANDHYD     0206  1 10.0   12.07    1.66  1.50  45.75  .52    .000
     [I%=30.0:S%= 1.00]
*
  *  CALIB STANDHYD     0204  1 10.0    3.90     .66  1.50  45.75  .52    .000
     [I%=30.0:S%= 1.90]
*
  *  CALIB STANDHYD     0104  1 10.0    3.83     .59  1.50  45.75  .52    .000
     [I%=30.0:S%=  .70]
*
  *  CALIB STANDHYD     0102  1 10.0    2.08     .36  1.50  45.75  .52    .000
     [I%=30.0:S%=  .70]
*
  *  CALIB STANDHYD     0100  1 10.0    1.97     .17  1.50  39.98  .46    .000
     [I%=20.0:S%=  .30]
*
  *  CALIB STANDHYD     0110  1 10.0     .74     .15  1.50  45.76  .52    .000
     [I%=30.0:S%=  .50]
*
  *  CALIB STANDHYD     0216  1 10.0     .98     .39  1.50  63.61  .73    .000
     [I%=61.0:S%= 1.50]
*
  *  CALIB NASHYD       0400  1 10.0    1.71     .20  1.50  35.21  .40    .000
     [CN=70.0         ]
     [ N = 3.0:Tp  .16]
*
     ADD [0206 + 0204]  0208  3 10.0   15.97    2.33  1.50  45.75  n/a    .000
*
     ADD [0102 + 0100]  0106  3 10.0    4.05     .53  1.50  42.94  n/a    .000
*
     ADD [0104 + 0106]  0108  3 10.0    7.88    1.12  1.50  44.31  n/a    .000
*
     ADD [0108 + 0110]  0200  3 10.0    8.62    1.27  1.50  44.43  n/a    .000
*
     PIPE   [ 2 : 0200] 0202  1 10.0    8.62    1.08  1.67  44.43  n/a    .000
*
     ADD [0208 + 0202]  0210  3 10.0   24.59    3.14  1.50  45.29  n/a    .000
*
     PIPE   [ 2 : 0210] 0212  1 10.0   24.59    2.96  1.67  45.29  n/a    .000
*
     ADD [0214 + 0212]  0218  3 10.0   31.53    3.44  1.67  45.39  n/a    .000
*
     ADD [0218 + 0216]  0220  3 10.0   32.51    3.78  1.50  45.94  n/a    .000
*
     RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .63  3.33  45.94  n/a    .000
     {ST=   .97 ha.m }
*
     ADD [0300 + 0222]  0302  3 10.0   35.86     .68  3.17  44.76  n/a    .000
```

```
*
  ***************************
  ** SIMULATION NUMBER:   7 **
  ***************************


--------------------
|    READ STORM    |    Filename: P:\Design Aids\Storm\HYD
|                  |              ROLOGY\StmFiles\25mm4hr.stm
| Ptotal= 25.00 mm |    Comments: Twenty-Five mm Four Hour Chicago Storm
--------------------
                 TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                  .17    2.07 |  1.17    5.70 |  2.17    5.19 |  3.17    2.80
                  .33    2.27 |  1.33   10.78 |  2.33    4.47 |  3.33    2.62
                  .50    2.52 |  1.50   50.21 |  2.50    3.95 |  3.50    2.48
                  .67    2.88 |  1.67   13.37 |  2.67    3.56 |  3.67    2.35
                  .83    3.38 |  1.83    8.29 |  2.83    3.25 |  3.83    2.23
                 1.00    4.18 |  2.00    6.30 |  3.00    3.01 |  4.00    2.14

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

--------------------
| CALIB            |
| NASHYD    (0300) |   Area    (ha)=   3.35   Curve Number   (CN)= 68.0
|ID= 1 DT=10.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=    .16

     Unit Hyd Qpeak  (cms)=    .800

     PEAK FLOW       (cms)=    .030 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=   3.361
     TOTAL RAINFALL   (mm)=  24.996
     RUNOFF COEFFICIENT   =    .134

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0214) |   Area    (ha)=   6.94
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.08         4.86
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .50          .50
     Length            (m)=     250.00       250.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      50.21          .00
                over (min)      10.00       890.00
     Storage Coeff.  (min)=       7.82 (ii)  888.62 (ii)
     Unit Hyd. Tpeak (min)=      10.00       890.00
     Unit Hyd. peak  (cms)=        .12          .00
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .22          .00           .224 (iii)
     TIME TO PEAK    (hrs)=       1.50          .00           1.50
     RUNOFF VOLUME    (mm)=      23.50          .00           7.05
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =        .94          .00            .28

***** 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)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0206) |   Area    (ha)=  12.07
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62         8.45
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     400.00       400.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      50.21          .00
                over (min)      10.00       960.00
     Storage Coeff.  (min)=       8.42 (ii)  956.93 (ii)
     Unit Hyd. Tpeak (min)=      10.00       960.00
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```
     Unit Hyd. peak  (cms)=        .12          .00
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .38          .00           .379 (iii)
     TIME TO PEAK    (hrs)=       1.50          .00           1.50
     RUNOFF VOLUME    (mm)=      23.50          .00           7.05
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =        .94          .00            .28

***** 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)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0204) |   Area    (ha)=   3.90
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.17         2.73
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=       1.90         1.90
     Length            (m)=     175.00       175.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      50.21          .00
                over (min)       10.00       490.00
     Storage Coeff.  (min)=       4.23 (ii)  480.66 (ii)
     Unit Hyd. Tpeak (min)=      10.00       490.00
     Unit Hyd. peak  (cms)=        .15          .00
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .15          .00           .151 (iii)
     TIME TO PEAK    (hrs)=       1.50          .00           1.50
     RUNOFF VOLUME    (mm)=      23.50          .00           7.05
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =        .94          .00            .28

***** 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)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0104) |   Area    (ha)=   3.83
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.15         2.68
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .70          .70
     Length            (m)=     180.00       180.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      50.21          .00
                over (min)       10.00       660.00
     Storage Coeff.  (min)=       5.81 (ii)  659.60 (ii)
     Unit Hyd. Tpeak (min)=      10.00       660.00
     Unit Hyd. peak  (cms)=        .14          .00
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .14          .00           .137 (iii)
     TIME TO PEAK    (hrs)=       1.50          .00           1.50
     RUNOFF VOLUME    (mm)=      23.50          .00           7.05
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =        .94          .00            .28

***** 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)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB             |
| STANDHYD  (0102) |   Area    (ha)=   2.08
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .62        1.46
     Dep. Storage     (mm)=       1.50        4.60
     Average Slope     (%)=        .70         .70
     Length            (m)=     100.00      100.00
     Mannings n          =       .015        .250

     Max.Eff.Inten.(mm/hr)=      50.21         .00
                over (min)       10.00      470.00
     Storage Coeff.  (min)=       4.08 (ii)  463.57 (ii)
     Unit Hyd. Tpeak (min)=      10.00      470.00
     Unit Hyd. peak  (cms)=        .16         .00
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .08         .00            .081 (iii)
     TIME TO PEAK    (hrs)=       1.50         .00            1.50
     RUNOFF VOLUME    (mm)=      23.50         .00            7.05
     TOTAL RAINFALL   (mm)=      25.00       25.00           25.00
     RUNOFF COEFFICIENT   =        .94         .00             .28

***** 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)=  2.00
            Fc    (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB             |
| STANDHYD  (0100) |   Area    (ha)=   1.97
|ID= 1 DT=10.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39        1.58
     Dep. Storage     (mm)=       1.50        4.60
     Average Slope     (%)=        .30         .30
     Length            (m)=     300.00      300.00
     Mannings n          =       .015        .250

     Max.Eff.Inten.(mm/hr)=      50.21         .00
                over (min)       10.00     1160.00
     Storage Coeff.  (min)=      10.17 (ii) 1155.53 (ii)
     Unit Hyd. Tpeak (min)=      10.00     1160.00
     Unit Hyd. peak  (cms)=        .11         .00
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .04         .00            .038 (iii)
     TIME TO PEAK    (hrs)=       1.50         .00            1.50
     RUNOFF VOLUME    (mm)=      23.50         .00            4.70
     TOTAL RAINFALL   (mm)=      25.00       25.00           25.00
     RUNOFF COEFFICIENT   =        .94         .00             .19

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo    (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc    (mm/hr)= 13.20     Cum.Inf.   (mm)=   .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  (0110) |   Area    (ha)=    .74
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .22         .52
     Dep. Storage     (mm)=       1.50        4.60
     Average Slope     (%)=        .50         .50
     Length            (m)=      50.00       50.00
     Mannings n          =       .015        .250

     Max.Eff.Inten.(mm/hr)=      50.21         .00
                over (min)       10.00      340.00
     Storage Coeff.  (min)=       2.98 (ii)  338.33 (ii)
     Unit Hyd. Tpeak (min)=      10.00      340.00
     Unit Hyd. peak  (cms)=        .16         .00
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .03         .00            .030 (iii)
     TIME TO PEAK    (hrs)=       1.50         .00            1.50
```

```
     RUNOFF VOLUME    (mm)=      23.50          .00           7.04
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =        .94          .00            .28

***** 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)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .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  (0216) |   Area    (ha)=    .98
|ID= 1 DT=10.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  61.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .60          .38
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=       1.50         1.50
     Length            (m)=      50.00        50.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      50.21          .00
                over (min)       10.00       250.00
     Storage Coeff.  (min)=       2.14 (ii)  243.33 (ii)
     Unit Hyd. Tpeak (min)=      10.00       250.00
     Unit Hyd. peak  (cms)=        .17          .00
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .08          .00           .083 (iii)
     TIME TO PEAK    (hrs)=       1.50          .00           1.50
     RUNOFF VOLUME    (mm)=      23.50          .00          14.33
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =        .94          .00            .57

***** 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)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0400) |   Area    (ha)=   1.71   Curve Number   (CN)= 70.0
|ID= 1 DT=10.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .16

     Unit Hyd Qpeak  (cms)=    .408

     PEAK FLOW       (cms)=    .017 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=   3.634
     TOTAL RAINFALL   (mm)=  24.996
     RUNOFF COEFFICIENT   =    .145

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

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

--------------------
| ADD HYD   (0208) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0206):    12.07    .379     1.50     7.05
        + ID2= 2 (0204):     3.90    .151     1.50     7.05
          ==================================================
          ID = 3 (0208):    15.97    .530     1.50     7.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0106) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0102):     2.08    .081     1.50     7.05
        + ID2= 2 (0100):     1.97    .038     1.50     4.70
          ==================================================
          ID = 3 (0106):     4.05    .119     1.50     5.90
```

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

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

 --------------------
 | ADD HYD   (0108) |
 |   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
 --------------------         (ha)    (cms)    (hrs)     (mm)
           ID1= 1 (0104):     3.83    .137     1.50     7.05
         + ID2= 2 (0106):     4.05    .119     1.50     5.90
           ===============================================
           ID = 3 (0108):     7.88    .256     1.50     6.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

 --------------------
 | ADD HYD   (0200) |
 |   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
 --------------------         (ha)    (cms)    (hrs)     (mm)
           ID1= 1 (0108):     7.88    .256     1.50     6.46
         + ID2= 2 (0110):      .74    .030     1.50     7.04
           ===============================================
           ID = 3 (0200):     8.62    .286     1.50     6.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 --------------------
 | ROUTE PIPE (0202)|     PIPE Number     =   1.00
 | IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
 | DT= 10.0 min     |     Length       (m)= 500.00
 --------------------     Slope      (m/m)=   .005
                          Manning n       =   .015

     **** WARNING: MINIMUM PIPE SIZE REQUIRED =   541.55   (mm)FOR FREE FLOW.
                   THIS SIZE WAS USED IN THE ROUTING.
                   THE CAPACITY OF THIS PIPE  =      .29  (cms)

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .03     .232E+01        .0           .33        25.23
        .06     .646E+01        .0           .52        16.17
        .09     .117E+02        .0           .66        12.56
        .11     .176E+02        .0           .79        10.57
        .14     .242E+02        .0           .90         9.29
        .17     .312E+02        .1           .99         8.39
        .20     .385E+02        .1          1.08         7.74
        .23     .461E+02        .1          1.15         7.24
        .26     .537E+02        .1          1.21         6.86
        .29     .614E+02        .2          1.27         6.56
        .31     .691E+02        .2          1.32         6.33
        .34     .767E+02        .2          1.36         6.15
        .37     .840E+02        .2          1.39         6.01
        .40     .910E+02        .3          1.41         5.93
        .43     .975E+02        .3          1.42         5.88
        .46     .104E+03        .3          1.42         5.89
        .48     .109E+03        .3          1.40         5.95
        .51     .113E+03        .3          1.36         6.11
        .54     .115E+03        .3          1.24         6.70
                                      <---- hydrograph ---->  <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0200)    8.62      .29    1.50   6.51       .44      1.42
     OUTFLOW: ID= 1 (0202)    8.62      .21    1.67   6.50       .34      1.36


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

 --------------------
 | ADD HYD   (0210) |
 |   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
 --------------------         (ha)    (cms)    (hrs)     (mm)
           ID1= 1 (0208):    15.97    .530     1.50     7.05
         + ID2= 2 (0202):     8.62    .212     1.67     6.50
           ===============================================
           ID = 3 (0210):    24.59    .689     1.50     6.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 --------------------
 | ROUTE PIPE (0212)|     PIPE Number     =   1.00
 | IN= 2---> OUT= 1 |     Diameter    (mm)=1050.00
 | DT= 10.0 min     |     Length       (m)= 360.00
 --------------------     Slope      (m/m)=   .005
                          Manning n       =   .015
```

```
     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .06     .629E+01       .0           .51       11.68
        .11     .175E+02       .0           .80        7.49
        .17     .316E+02       .1          1.03        5.82
        .22     .478E+02       .2          1.23        4.89
        .28     .655E+02       .3          1.40        4.30
        .33     .844E+02       .4          1.54        3.89
        .39     .104E+03       .5          1.67        3.58
        .44     .125E+03       .6          1.79        3.35
        .50     .145E+03       .8          1.89        3.18
        .55     .166E+03       .9          1.98        3.04
        .61     .187E+03      1.1          2.05        2.93
        .66     .207E+03      1.2          2.11        2.85
        .72     .227E+03      1.4          2.15        2.78
        .77     .246E+03      1.5          2.19        2.74
        .83     .264E+03      1.6          2.20        2.72
        .88     .280E+03      1.7          2.20        2.73
        .94     .294E+03      1.8          2.18        2.75
        .99     .305E+03      1.8          2.12        2.83
       1.05     .312E+03      1.7          1.93        3.10
                                   <---- hydrograph ---->   <-pipe / channel->
                             AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                             (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0210)  24.59      .69    1.50   6.86       .47      1.84
     OUTFLOW: ID= 1 (0212)  24.59      .64    1.67   6.85       .45      1.80


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

--------------------
| ADD HYD   (0218) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0214):     6.94    .224     1.50     7.05
        + ID2= 2 (0212):    24.59    .642     1.67     6.85
          ===============================================
          ID = 3 (0218):    31.53    .760     1.67     6.90

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0220) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0218):    31.53    .760     1.67     6.90
        + ID2= 2 (0216):      .98    .083     1.50    14.33
          ===============================================
          ID = 3 (0220):    32.51    .783     1.67     7.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0222) |
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .5930      .9225
                           .0640      .0502   |    .6190      .9540
                           .0980      .2651   |    .6430      .9861
                           .1150      .5063   |    .6670     1.0262
                           .1220      .4899   |    .6900     1.0672
                           .1240      .5425   |    .9900     1.1090
                           .2770      .5951   |   2.3340     1.1450
                           .3420      .6476   |   4.5260     1.1830
                           .3920      .7002   |   7.3160     1.2200
                           .4340      .7528   |    .0000      .0000

                                 AREA      QPEAK       TPEAK        R.V.
                                 (ha)      (cms)       (hrs)        (mm)
     INFLOW : ID= 2 (0220)     32.510       .783        1.67        7.12
     OUTFLOW: ID= 1 (0222)     32.510       .080        3.17        7.12

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 10.27
                   TIME SHIFT OF PEAK FLOW         (min)= 90.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .1539

     **** ERROR : CHECK THE STORAGE-DISCHARGE TABLE.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0302) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0300):     3.35    .030     1.50     3.36
        + ID2= 2 (0222):    32.51    .080     3.17     7.12
```

```
          ==================================================
          ID = 3 (0302):    35.86    .098     1.67     6.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

 FINISH
===========================================================================================================
```

==

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

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

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***** S U M M A R Y   O U T P U T *****

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: P:\Project Management\2012\12089.01 - Sean Mason, Essa Rd. Ph.2, Barrie\50 - Design Notes\12089.01 - OTTHYMO
- rev1\Post
  Summary filename: P:\Project Management\2012\12089.01 - Sean Mason, Essa Rd. Ph.2, Barrie\50 - Design Notes\12089.01 - OTTHYMO
- rev1\Post


DATE: 5/25/2016                          TIME: 15:34:01

USER:


COMMENTS: Post Development - 24 Hour SCS Storm


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

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 15.0
      [ Ptot= 55.00 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\2yr_24hr_scs.stm
      remark: 24hr 2year SCS STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0300  1 10.0    3.35     .14 12.00  15.11  .27    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  *   CALIB STANDHYD     0216  1 10.0     .98     .10 12.00  32.67  .59    .000
      [I%=61.0:S%= 1.50]
*
  *   CALIB STANDHYD     0110  1 10.0     .74     .04 12.00  16.11  .29    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0100  1 10.0    1.97     .06 12.00  10.73  .20    .000
      [I%=20.0:S%=  .30]
*
  *   CALIB STANDHYD     0102  1 10.0    2.08     .10 12.00  16.11  .29    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0104  1 10.0    3.83     .18 12.00  16.10  .29    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0204  1 10.0    3.90     .19 12.00  16.11  .29    .000
      [I%=30.0:S%= 1.90]
*
  *   CALIB STANDHYD     0206  1 10.0   12.07     .54 12.00  16.09  .29    .000
      [I%=30.0:S%= 1.00]
*
  *   CALIB STANDHYD     0214  1 10.0    6.94     .32 12.00  16.09  .29    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB NASHYD       0400  1 10.0    1.71     .08 12.00  16.11  .29    .000
      [CN=70.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0100 + 0102]  0106  3 10.0    4.05     .16 12.00  13.49  n/a    .000
*
      ADD [0106 + 0104]  0108  3 10.0    7.88     .34 12.00  14.76  n/a    .000
*
      ADD [0204 + 0206]  0208  3 10.0   15.97     .73 12.00  16.09  n/a    .000
*
      ADD [0110 + 0108]  0200  3 10.0    8.62     .38 12.00  14.87  n/a    .000
```

```
*
     PIPE   [ 2 : 0200] 0202  1 10.0    8.62     .33 12.00  14.86  n/a    .000
*
     ADD [0202 + 0208]  0210  3 10.0   24.59    1.06 12.00  15.66  n/a    .000
*
     PIPE   [ 2 : 0210] 0212  1 10.0   24.59     .98 12.00  15.66  n/a    .000
*
     ADD [0212 + 0214]  0218  3 10.0   31.53    1.29 12.00  15.76  n/a    .000
*
     ADD [0216 + 0218]  0220  3 10.0   32.51    1.39 12.00  16.27  n/a    .000
*
     RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .10 13.00  16.26  n/a    .000
     {ST=   .27 ha.m }
*
     ADD [0300 + 0222]  0302  3 10.0   35.86     .23 12.00  16.15  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

     START @   .00 hrs
     --------------------
     READ STORM                 15.0
     [ Ptot= 76.00 mm ]
     fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\5yr_24hr_scs.stm
     remark: 24hr 5year SCS STORM - CITY OF BARRIE
*
  ** CALIB NASHYD       0300  1 10.0    3.35     .26 12.00  26.40  .35    .000
     [CN=68.0        ]
     [ N = 3.0:Tp  .16]
*
  *  CALIB STANDHYD     0216  1 10.0     .98     .15 12.00  48.98  .64    .000
     [I%=61.0:S%= 1.50]
*
  *  CALIB STANDHYD     0110  1 10.0     .74     .06 12.00  28.69  .38    .000
     [I%=30.0:S%=  .50]
*
  *  CALIB STANDHYD     0100  1 10.0    1.97     .08 12.00  22.12  .29    .000
     [I%=20.0:S%=  .30]
*
  *  CALIB STANDHYD     0102  1 10.0    2.08     .15 12.00  28.69  .38    .000
     [I%=30.0:S%=  .70]
*
  *  CALIB STANDHYD     0104  1 10.0    3.83     .26 12.00  28.69  .38    .000
     [I%=30.0:S%=  .70]
*
  *  CALIB STANDHYD     0204  1 10.0    3.90     .28 12.00  28.69  .38    .000
     [I%=30.0:S%= 1.90]
*
  *  CALIB STANDHYD     0206  1 10.0   12.07     .77 12.00  28.68  .38    .000
     [I%=30.0:S%= 1.00]
*
  *  CALIB STANDHYD     0214  1 10.0    6.94     .45 12.00  28.68  .38    .000
     [I%=30.0:S%=  .50]
*
  *  CALIB NASHYD       0400  1 10.0    1.71     .14 12.00  27.95  .37    .000
     [CN=70.0        ]
     [ N = 3.0:Tp  .16]
*
     ADD [0100 + 0102]  0106  3 10.0    4.05     .23 12.00  25.49  n/a    .000
*
     ADD [0106 + 0104]  0108  3 10.0    7.88     .49 12.00  27.05  n/a    .000
*
     ADD [0204 + 0206]  0208  3 10.0   15.97    1.05 12.00  28.68  n/a    .000
*
     ADD [0110 + 0108]  0200  3 10.0    8.62     .55 12.00  27.19  n/a    .000
*
     PIPE   [ 2 : 0200] 0202  1 10.0    8.62     .48 12.00  27.18  n/a    .000
*
     ADD [0202 + 0208]  0210  3 10.0   24.59    1.53 12.00  28.16  n/a    .000
*
     PIPE   [ 2 : 0210] 0212  1 10.0   24.59    1.42 12.00  28.16  n/a    .000
*
     ADD [0212 + 0214]  0218  3 10.0   31.53    1.87 12.00  28.27  n/a    .000
*
     ADD [0216 + 0218]  0220  3 10.0   32.51    2.02 12.00  28.90  n/a    .000
*
     RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .12 15.33  28.89  n/a    .000
     {ST=   .54 ha.m }
*
     ADD [0300 + 0222]  0302  3 10.0   35.86     .35 12.00  28.66  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
```

```
                                 min     ha     cms   hrs     mm           cms

      START @   .00 hrs
      --------------------
      READ STORM                15.0
      [ Ptot= 89.90 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\10yr_24hr_scs.stm
      remark: 24hr 10year SCS STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0300  1 10.0    3.35     .34 12.00  34.82  .39    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  *   CALIB STANDHYD     0216  1 10.0     .98     .19 12.00  59.85  .67    .000
      [I%=61.0:S%= 1.50]
*
  *   CALIB STANDHYD     0110  1 10.0     .74     .09 12.00  37.16  .41    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0100  1 10.0    1.97     .10 12.00  29.83  .33    .000
      [I%=20.0:S%=  .30]
*
  *   CALIB STANDHYD     0102  1 10.0    2.08     .19 12.00  37.16  .41    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0104  1 10.0    3.83     .32 12.00  37.16  .41    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0204  1 10.0    3.90     .36 12.00  37.16  .41    .000
      [I%=30.0:S%= 1.90]
*
  *   CALIB STANDHYD     0206  1 10.0   12.07     .94 12.00  37.16  .41    .000
      [I%=30.0:S%= 1.00]
*
  *   CALIB STANDHYD     0214  1 10.0    6.94     .55 12.00  37.16  .41    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB NASHYD       0400  1 10.0    1.71     .18 12.00  36.72  .41    .000
      [CN=70.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0100 + 0102]  0106  3 10.0    4.05     .29 12.00  33.59  n/a    .000
*
      ADD [0106 + 0104]  0108  3 10.0    7.88     .61 12.00  35.33  n/a    .000
*
      ADD [0204 + 0206]  0208  3 10.0   15.97    1.30 12.00  37.16  n/a    .000
*
      ADD [0110 + 0108]  0200  3 10.0    8.62     .70 12.00  35.48  n/a    .000
*
      PIPE   [ 2 : 0200] 0202  1 10.0    8.62     .60 12.00  35.48  n/a    .000
*
      ADD [0202 + 0208]  0210  3 10.0   24.59    1.90 12.00  36.57  n/a    .000
*
      PIPE   [ 2 : 0210] 0212  1 10.0   24.59    1.75 12.00  36.57  n/a    .000
*
      ADD [0212 + 0214]  0218  3 10.0   31.53    2.30 12.00  36.70  n/a    .000
*
      ADD [0216 + 0218]  0220  3 10.0   32.51    2.49 12.00  37.40  n/a    .000
*
      RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .34 14.17  37.39  n/a    .000
      {ST=   .64 ha.m }
*
      ADD [0300 + 0222]  0302  3 10.0   35.86     .44 12.00  37.15  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                 min     ha     cms   hrs     mm           cms

      START @   .00 hrs
      --------------------
      READ STORM                15.0
      [ Ptot=107.50 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\25yr_24hr_scs.stm
      remark: 24hr 25year SCS STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0300  1 10.0    3.35     .45 12.00  46.32  .43    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  *   CALIB STANDHYD     0216  1 10.0     .98     .24 12.00  73.96  .69    .000
      [I%=61.0:S%= 1.50]
*
  *   CALIB STANDHYD     0110  1 10.0     .74     .12 12.00  48.48  .45    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0100  1 10.0    1.97     .12 12.00  40.26  .37    .000
      [I%=20.0:S%=  .30]
```

```
*
  *   CALIB STANDHYD     0102  1 10.0    2.08     .27 12.00  48.48  .45    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0104  1 10.0    3.83     .41 12.00  48.48  .45    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0204  1 10.0    3.90     .51 12.00  48.48  .45    .000
      [I%=30.0:S%= 1.90]
*
  *   CALIB STANDHYD     0206  1 10.0   12.07    1.17 12.00  48.48  .45    .000
      [I%=30.0:S%= 1.00]
*
  *   CALIB STANDHYD     0214  1 10.0    6.94     .68 12.00  48.48  .45    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB NASHYD       0400  1 10.0    1.71     .24 12.00  48.63  .45    .000
      [CN=70.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0100 + 0102]  0106  3 10.0    4.05     .40 12.00  44.48  n/a    .000
*
      ADD [0106 + 0104]  0108  3 10.0    7.88     .81 12.00  46.43  n/a    .000
*
      ADD [0204 + 0206]  0208  3 10.0   15.97    1.68 12.00  48.48  n/a    .000
*
      ADD [0110 + 0108]  0200  3 10.0    8.62     .93 12.00  46.60  n/a    .000
*
      PIPE   [ 2 : 0200] 0202  1 10.0    8.62     .80 12.00  46.60  n/a    .000
*
      ADD [0202 + 0208]  0210  3 10.0   24.59    2.47 12.00  47.82  n/a    .000
*
      PIPE   [ 2 : 0210] 0212  1 10.0   24.59    2.28 12.00  47.82  n/a    .000
*
      ADD [0212 + 0214]  0218  3 10.0   31.53    2.96 12.00  47.97  n/a    .000
*
      ADD [0216 + 0218]  0220  3 10.0   32.51    3.21 12.00  48.75  n/a    .000
*
      RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .50 14.00  48.74  n/a    .000
      {ST=   .82 ha.m }
*
      ADD [0300 + 0222]  0302  3 10.0   35.86     .56 12.00  48.52  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 15.0
      [ Ptot=120.60 mm ]
      fname : P:\Design Aids\Storm\HYDROLOGY\StmFiles\City of Barrie - 2010\50yr_24hr_scs.stm
      remark: 24hr 50year SCS STORM - CITY OF BARRIE
*
  **  CALIB NASHYD       0300  1 10.0    3.35     .54 12.00  55.37  .46    .000
      [CN=68.0         ]
      [ N = 3.0:Tp  .16]
*
  *   CALIB STANDHYD     0216  1 10.0     .98     .31 12.00  84.56  .70    .000
      [I%=61.0:S%= 1.50]
*
  *   CALIB STANDHYD     0110  1 10.0     .74     .15 12.00  57.10  .47    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB STANDHYD     0100  1 10.0    1.97     .14 12.00  48.24  .40    .000
      [I%=20.0:S%=  .30]
*
  *   CALIB STANDHYD     0102  1 10.0    2.08     .32 12.00  57.10  .47    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0104  1 10.0    3.83     .50 12.00  57.10  .47    .000
      [I%=30.0:S%=  .70]
*
  *   CALIB STANDHYD     0204  1 10.0    3.90     .60 12.00  57.10  .47    .000
      [I%=30.0:S%= 1.90]
*
  *   CALIB STANDHYD     0206  1 10.0   12.07    1.34 12.00  57.10  .47    .000
      [I%=30.0:S%= 1.00]
*
  *   CALIB STANDHYD     0214  1 10.0    6.94     .79 12.00  57.10  .47    .000
      [I%=30.0:S%=  .50]
*
  *   CALIB NASHYD       0400  1 10.0    1.71     .29 12.00  57.97  .48    .000
      [CN=70.0         ]
      [ N = 3.0:Tp  .16]
*
      ADD [0100 + 0102]  0106  3 10.0    4.05     .47 12.00  52.79  n/a    .000
```

```
*
      ADD [0106 + 0104]  0108  3 10.0    7.88     .97 12.00  54.88  n/a    .000
*
      ADD [0204 + 0206]  0208  3 10.0   15.97    1.94 12.00  57.10  n/a    .000
*
      ADD [0110 + 0108]  0200  3 10.0    8.62    1.12 12.00  55.07  n/a    .000
*
      PIPE   [ 2 : 0200] 0202  1 10.0    8.62     .96 12.00  55.06  n/a    .000
*
      ADD [0202 + 0208]  0210  3 10.0   24.59    2.90 12.00  56.38  n/a    .000
*
      PIPE   [ 2 : 0210] 0212  1 10.0   24.59    2.68 12.00  56.38  n/a    .000
*
      ADD [0212 + 0214]  0218  3 10.0   31.53    3.47 12.00  56.54  n/a    .000
*
      ADD [0216 + 0218]  0220  3 10.0   32.51    3.78 12.00  57.39  n/a    .000
*
      RESRVR [ 2 : 0220] 0222  1 10.0   32.51     .63 13.50  57.38  n/a    .000
      {ST=   .97 ha.m }
*
      ADD [0300 + 0222]  0302  3 10.0   35.86     .69 14.00  57.19  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************


--------------------
|    READ STORM    |    Filename: P:\Design Aids\Storm\HYDROL
|                  |              OGY\StmFiles\City of Barrie - 2010\
|                  |              100yr_24hr_scs.stm
| Ptotal=133.60 mm |    Comments: 24hr 100year SCS STORM - CITY OF BARRIE
--------------------
                 TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                  .25    1.34 |  6.25    2.67 | 12.25   19.24 | 18.25    2.40
                  .50    1.34 |  6.50    2.67 | 12.50   19.24 | 18.50    2.40
                  .75    1.34 |  6.75    2.67 | 12.75    9.89 | 18.75    2.40
                 1.00    1.34 |  7.00    2.67 | 13.00    9.89 | 19.00    2.40
                 1.25    1.34 |  7.25    2.67 | 13.25    1.87 | 19.25    2.40
                 1.50    1.34 |  7.50    2.67 | 13.50    1.87 | 19.50    2.40
                 1.75    1.34 |  7.75    2.67 | 13.75   10.96 | 19.75    2.40
                 2.00    2.40 |  8.00    2.67 | 14.00   10.96 | 20.00    2.40
                 2.25    1.74 |  8.25    3.61 | 14.25    4.01 | 20.25    1.60
                 2.50    1.74 |  8.50    3.61 | 14.50    4.01 | 20.50    1.60
                 2.75    1.74 |  8.75    3.61 | 14.75    4.01 | 20.75    1.60
                 3.00    1.74 |  9.00    3.61 | 15.00    4.01 | 21.00    1.60
                 3.25    1.74 |  9.25    4.28 | 15.25    4.01 | 21.25    1.60
                 3.50    1.74 |  9.50    4.28 | 15.50    4.01 | 21.50    1.60
                 3.75    1.74 |  9.75    4.81 | 15.75    4.01 | 21.75    1.60
                 4.00    1.74 | 10.00    4.81 | 16.00    4.01 | 22.00    1.60
                 4.25    2.14 | 10.25    6.15 | 16.25    2.40 | 22.25    1.60
                 4.50    2.14 | 10.50    6.15 | 16.50    2.40 | 22.50    1.60
                 4.75    2.14 | 10.75    8.28 | 16.75    2.40 | 22.75    1.60
                 5.00    2.14 | 11.00    8.28 | 17.00    2.40 | 23.00    1.60
                 5.25    2.14 | 11.25   12.83 | 17.25    2.40 | 23.25    1.60
                 5.50    2.14 | 11.50   12.83 | 17.50    2.40 | 23.50    1.60
                 5.75    2.14 | 11.75   55.58 | 17.75    2.40 | 23.75    1.60
                 6.00    2.14 | 12.00  147.49 | 18.00    2.40 | 24.00    1.60

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

--------------------
| CALIB            |
| NASHYD    (0300) |   Area    (ha)=   3.35   Curve Number   (CN)= 68.0
|ID= 1 DT=10.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .16

         NOTE:  RAINFALL WAS TRANSFORMED TO  10.0 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
                 .167    1.34 | 6.167    2.67 |12.167   19.24 | 18.17    2.40
                 .333    1.34 | 6.333    2.67 |12.333   19.24 | 18.33    2.40
                 .500    1.34 | 6.500    2.67 |12.500   19.24 | 18.50    2.40
                 .667    1.34 | 6.667    2.67 |12.667    9.89 | 18.67    2.40
                 .833    1.34 | 6.833    2.67 |12.833    9.89 | 18.83    2.40
                1.000    1.34 | 7.000    2.67 |13.000    9.89 | 19.00    2.40
                1.167    1.34 | 7.167    2.67 |13.167    1.87 | 19.17    2.40
                1.333    1.34 | 7.333    2.67 |13.333    1.87 | 19.33    2.40
                1.500    1.34 | 7.500    2.67 |13.500    1.87 | 19.50    2.40
                1.667    1.34 | 7.667    2.67 |13.667   10.96 | 19.67    2.40
                1.833    1.87 | 7.833    2.67 |13.833   10.96 | 19.83    2.40
                2.000    2.40 | 8.000    2.67 |14.000   10.95 | 20.00    2.40
                2.167    1.74 | 8.167    3.61 |14.167    4.01 | 20.17    1.60
                2.333    1.74 | 8.333    3.61 |14.333    4.01 | 20.33    1.60
                2.500    1.74 | 8.500    3.61 |14.500    4.01 | 20.50    1.60
                2.667    1.74 | 8.667    3.61 |14.667    4.01 | 20.67    1.60
```

```
             2.833    1.74 | 8.833    3.61 |14.833    4.01 | 20.83    1.60
             3.000    1.74 | 9.000    3.61 |15.000    4.01 | 21.00    1.60
             3.167    1.74 | 9.167    4.28 |15.167    4.01 | 21.17    1.60
             3.333    1.74 | 9.333    4.28 |15.333    4.01 | 21.33    1.60
             3.500    1.74 | 9.500    4.28 |15.500    4.01 | 21.50    1.60
             3.667    1.74 | 9.667    4.81 |15.667    4.01 | 21.67    1.60
             3.833    1.74 | 9.833    4.81 |15.833    4.01 | 21.83    1.60
             4.000    1.74 |10.000    4.81 |16.000    4.01 | 22.00    1.60
             4.167    2.14 |10.167    6.15 |16.167    2.40 | 22.17    1.60
             4.333    2.14 |10.333    6.15 |16.333    2.40 | 22.33    1.60
             4.500    2.14 |10.500    6.15 |16.500    2.40 | 22.50    1.60
             4.667    2.14 |10.667    8.28 |16.667    2.40 | 22.67    1.60
             4.833    2.14 |10.833    8.28 |16.833    2.40 | 22.83    1.60
             5.000    2.14 |11.000    8.28 |17.000    2.40 | 23.00    1.60
             5.167    2.14 |11.167   12.83 |17.167    2.40 | 23.17    1.60
             5.333    2.14 |11.333   12.83 |17.333    2.40 | 23.33    1.60
             5.500    2.14 |11.500   12.83 |17.500    2.40 | 23.50    1.60
             5.667    2.14 |11.667   55.58 |17.667    2.40 | 23.67    1.60
             5.833    2.14 |11.833  101.54 |17.833    2.40 | 23.83    1.60
             6.000    2.14 |12.000  147.49 |18.000    2.40 | 24.00    1.60

     Unit Hyd Qpeak  (cms)=    .800

     PEAK FLOW       (cms)=    .632 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  64.693
     TOTAL RAINFALL   (mm)= 133.600
     RUNOFF COEFFICIENT   =    .484

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0216) |   Area    (ha)=    .98
|ID= 1 DT=10.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  61.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .60          .38
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=       1.50         1.50
     Length            (m)=      50.00        50.00
     Mannings n          =        .015         .250

     Max.Eff.Inten.(mm/hr)=     147.49       129.60
                over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.39 (ii)    9.32 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=        .17          .11
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .24          .11           .355 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.00          12.00
     RUNOFF VOLUME    (mm)=     132.10        37.94          95.38
     TOTAL RAINFALL   (mm)=     133.60       133.60         133.60
     RUNOFF COEFFICIENT   =        .99          .28            .71

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0110) |   Area    (ha)=    .74
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .22          .52
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .50          .50
     Length            (m)=      50.00        50.00
     Mannings n          =        .015         .250

     Max.Eff.Inten.(mm/hr)=     147.49       105.70
                over (min)       10.00        20.00
     Storage Coeff.  (min)=       1.94 (ii)   13.90 (ii)
     Unit Hyd. Tpeak (min)=      10.00        20.00
     Unit Hyd. peak  (cms)=        .17          .07
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .09          .10           .179 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.17          12.00
     RUNOFF VOLUME    (mm)=     132.10        37.94          66.19
     TOTAL RAINFALL   (mm)=     133.60       133.60         133.60
     RUNOFF COEFFICIENT   =        .99          .28            .50
```

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0100) |   Area    (ha)=   1.97
|ID= 1 DT=10.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39         1.58
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .30          .30
     Length            (m)=     300.00       300.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=     147.49        37.94
                over (min)       10.00        70.00
     Storage Coeff.  (min)=       6.61 (ii)   68.16 (ii)
     Unit Hyd. Tpeak (min)=      10.00        70.00
     Unit Hyd. peak  (cms)=        .13          .02
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .15          .09           .166 (iii)
     TIME TO PEAK    (hrs)=      12.00        13.00          12.00
     RUNOFF VOLUME    (mm)=     132.10        37.94          56.77
     TOTAL RAINFALL   (mm)=     133.60       133.60         133.60
     RUNOFF COEFFICIENT   =        .99          .28            .42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .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  (0102) |   Area    (ha)=   2.08
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .62         1.46
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .70          .70
     Length            (m)=     100.00       100.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=     147.49       105.70
                over (min)       10.00        20.00
     Storage Coeff.  (min)=       2.65 (ii)   19.04 (ii)
     Unit Hyd. Tpeak (min)=      10.00        20.00
     Unit Hyd. peak  (cms)=        .17          .06
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .25          .25           .459 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.17          12.00
     RUNOFF VOLUME    (mm)=     132.10        37.94          66.19
     TOTAL RAINFALL   (mm)=     133.60       133.60         133.60
     RUNOFF COEFFICIENT   =        .99          .28            .50

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .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  (0104) |   Area    (ha)=   3.83
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.15         2.68
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .70          .70
     Length            (m)=     180.00       180.00
```

```
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=     147.49        72.35
                over (min)       10.00        40.00
     Storage Coeff.  (min)=       3.77 (ii)   30.91 (ii)
     Unit Hyd. Tpeak (min)=      10.00        40.00
     Unit Hyd. peak  (cms)=        .16          .03
                                                              *TOTALS*
     PEAK FLOW       (cms)=        .46          .29             .572 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.50            12.00
     RUNOFF VOLUME    (mm)=     132.10        37.94            66.19
     TOTAL RAINFALL   (mm)=     133.60       133.60           133.60
     RUNOFF COEFFICIENT   =        .99          .28              .50

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .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  (0204) |   Area    (ha)=   3.90
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.17         2.73
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=       1.90         1.90
     Length            (m)=     175.00       175.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=     147.49       105.70
                over (min)       10.00        20.00
     Storage Coeff.  (min)=       2.75 (ii)   19.74 (ii)
     Unit Hyd. Tpeak (min)=      10.00        20.00
     Unit Hyd. peak  (cms)=        .17          .06
                                                              *TOTALS*
     PEAK FLOW       (cms)=        .48          .46             .852 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.17            12.00
     RUNOFF VOLUME    (mm)=     132.10        37.94            66.19
     TOTAL RAINFALL   (mm)=     133.60       133.60           133.60
     RUNOFF COEFFICIENT   =        .99          .28              .50

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .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  (0206) |   Area    (ha)=  12.07
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62         8.45
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     400.00       400.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=     147.49        44.67
                over (min)       10.00        60.00
     Storage Coeff.  (min)=       5.47 (ii)   53.22 (ii)
     Unit Hyd. Tpeak (min)=      10.00        60.00
     Unit Hyd. peak  (cms)=        .14          .02
                                                              *TOTALS*
     PEAK FLOW       (cms)=       1.40          .59            1.541 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.83            12.00
     RUNOFF VOLUME    (mm)=     132.10        37.94            66.19
     TOTAL RAINFALL   (mm)=     133.60       133.60           133.60
     RUNOFF COEFFICIENT   =        .99          .28              .50

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0214) |   Area    (ha)=   6.94
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.08         4.86
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .50          .50
     Length            (m)=     250.00       250.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=     147.49        44.67
                over (min)       10.00        50.00
     Storage Coeff.  (min)=       5.08 (ii)   49.42 (ii)
     Unit Hyd. Tpeak (min)=      10.00        50.00
     Unit Hyd. peak  (cms)=        .15          .02
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .81          .37           .922 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.67          12.00
     RUNOFF VOLUME    (mm)=     132.10        37.94          66.19
     TOTAL RAINFALL   (mm)=     133.60       133.60         133.60
     RUNOFF COEFFICIENT   =        .99          .28            .50

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0400) |   Area    (ha)=   1.71   Curve Number   (CN)= 70.0
|ID= 1 DT=10.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .16

     Unit Hyd Qpeak  (cms)=    .408

     PEAK FLOW       (cms)=    .338 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  67.570
     TOTAL RAINFALL   (mm)= 133.600
     RUNOFF COEFFICIENT   =    .506

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

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--------------------
| ADD HYD   (0106) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0100):     1.97    .166    12.00    56.77
        + ID2= 2 (0102):     2.08    .459    12.00    66.19
          ==================================================
          ID = 3 (0106):     4.05    .626    12.00    61.61

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0108) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0106):     4.05    .626    12.00    61.61
        + ID2= 2 (0104):     3.83    .572    12.00    66.19
          ==================================================
          ID = 3 (0108):     7.88   1.198    12.00    63.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0208) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0204):     3.90    .852    12.00    66.19
        + ID2= 2 (0206):    12.07   1.541    12.00    66.19
          ==================================================
          ID = 3 (0208):    15.97   2.393    12.00    66.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD   (0200) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):      .74     .179    12.00    66.19
        + ID2= 2 (0108):     7.88    1.198    12.00    63.84
          ==================================================
          ID = 3 (0200):     8.62    1.377    12.00    64.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ROUTE PIPE (0202)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT= 10.0 min     |     Length       (m)= 500.00
--------------------     Slope      (m/m)=   .005
                         Manning n       =   .015

     **** WARNING: MINIMUM PIPE SIZE REQUIRED =   975.83   (mm)FOR FREE FLOW.
                   THIS SIZE WAS USED IN THE ROUTING.
                   THE CAPACITY OF THIS PIPE  =     1.38  (cms)

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .05     .754E+01        .0           .49        17.04
        .10     .210E+02        .0           .76        10.92
        .15     .379E+02        .1           .98         8.48
        .21     .573E+02        .1          1.17         7.14
        .26     .786E+02        .2          1.33         6.27
        .31     .101E+03        .3          1.47         5.67
        .36     .125E+03        .4          1.59         5.23
        .41     .150E+03        .5          1.70         4.89
        .46     .174E+03        .6          1.80         4.63
        .51     .200E+03        .8          1.88         4.43
        .56     .224E+03        .9          1.95         4.27
        .62     .249E+03       1.0          2.01         4.15
        .67     .273E+03       1.1          2.05         4.06
        .72     .295E+03       1.2          2.08         4.00
        .77     .317E+03       1.3          2.10         3.97
        .82     .336E+03       1.4          2.10         3.97
        .87     .353E+03       1.5          2.07         4.02
        .92     .366E+03       1.5          2.02         4.12
        .98     .374E+03       1.4          1.84         4.52
                                    <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0200)    8.62     1.38   12.00  64.04      .80       2.10
     OUTFLOW: ID= 1 (0202)    8.62     1.18   12.00  64.03      .69       2.07


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--------------------
| ADD HYD   (0210) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0202):     8.62    1.179    12.00    64.03
        + ID2= 2 (0208):    15.97    2.393    12.00    66.19
          ==================================================
          ID = 3 (0210):    24.59    3.573    12.00    65.43

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE PIPE (0212)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1050.00
| DT= 10.0 min     |     Length       (m)= 360.00
--------------------     Slope      (m/m)=   .005
                         Manning n       =   .015

     **** WARNING: MINIMUM PIPE SIZE REQUIRED =  1395.35   (mm)FOR FREE FLOW.
                   THIS SIZE WAS USED IN THE ROUTING.
                   THE CAPACITY OF THIS PIPE  =     3.57  (cms)

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .07     .111E+02        .0           .62         9.66
        .15     .309E+02        .1           .97         6.19
        .22     .558E+02        .2          1.25         4.81
        .29     .843E+02        .3          1.48         4.05
        .37     .116E+03        .5          1.69         3.56
        .44     .149E+03        .8          1.87         3.22
        .51     .184E+03       1.0          2.02         2.96
```

```
       .59     .220E+03       1.3          2.16         2.77
       .66     .257E+03       1.6          2.28         2.63
       .73     .294E+03       1.9          2.39         2.51
       .81     .330E+03       2.3          2.48         2.42
       .88     .366E+03       2.6          2.55         2.35
       .95     .401E+03       2.9          2.60         2.30
      1.03     .435E+03       3.2          2.64         2.27
      1.10     .466E+03       3.4          2.66         2.25
      1.18     .495E+03       3.7          2.66         2.25
      1.25     .520E+03       3.8          2.63         2.28
      1.32     .539E+03       3.8          2.56         2.34
      1.40     .551E+03       3.6          2.34         2.57
                                   <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0210)   24.59     3.57   12.00  65.43      1.15      2.66
     OUTFLOW: ID= 1 (0212)   24.59     3.29   12.00  65.43      1.06      2.65

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

--------------------
| ADD HYD   (0218) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0212):    24.59   3.291    12.00    65.43
        + ID2= 2 (0214):     6.94    .922    12.00    66.19
          ==================================================
          ID = 3 (0218):    31.53   4.213    12.00    65.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0220) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0216):      .98    .355    12.00    95.38
        + ID2= 2 (0218):    31.53   4.213    12.00    65.60
          ==================================================
          ID = 3 (0220):    32.51   4.569    12.00    66.50

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| RESERVOIR (0222) |
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .5930       .9225
                           .0640      .0502   |    .6190       .9540
                           .0980      .2651   |    .6430       .9861
                           .1150      .5063   |    .6670      1.0742
                           .1220      .4899   |    .6900      1.1152
                           .1240      .5425   |    .9900      1.1570
                           .2770      .5951   |   2.3340      1.1930
                           .3420      .6476   |   4.5260      1.2310
                           .3920      .7002   |   7.3160      1.2680
                           .4340      .7528   |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0220)     32.510      4.569       12.00       66.50
     OUTFLOW: ID= 1 (0222)     32.510       .916       13.17       66.49

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.05
                   TIME SHIFT OF PEAK FLOW         (min)= 70.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  1.1499

     **** ERROR : CHECK THE STORAGE-DISCHARGE TABLE.
-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0302) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0300):     3.35    .632    12.00    64.69
        + ID2= 2 (0222):    32.51    .916    13.17    66.49
          ==================================================
          ID = 3 (0302):    35.86    .948    13.17    66.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
```



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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: C:\Users\tarkell\Desktop\12089~1.01-\Post - Regional.out
  Summary filename: C:\Users\tarkell\Desktop\12089~1.01-\Post - Regional.sum


DATE: 2/21/2017                           TIME: 13:06:45

USER:



COMMENTS: Post Development – Regional Storm Hazel


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


--------------------
|    READ STORM    |    Filename: C:\Users\tarkell\Desktop
|                  |              \StmFiles\hazel-hr.stm
| Ptotal=212.00 mm |    Comments: Hurricane Hazel for the last 12 hrs of t
--------------------
                 TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 1.00    6.00 |  4.00   13.00 |  7.00   23.00 | 10.00   53.00
                 2.00    4.00 |  5.00   17.00 |  8.00   13.00 | 11.00   38.00
                 3.00    6.00 |  6.00   13.00 |  9.00   13.00 | 12.00   13.00

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

--------------------
| CALIB            |
| STANDHYD  (0214) |   Area    (ha)=   6.94
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.08         4.86
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .50          .50
     Length            (m)=     250.00       250.00
     Mannings n          =       .015         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO  10.0 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
                 .167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
                 .333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
                 .500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
                 .667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
                 .833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
                1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
                1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
                1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
                1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
                1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
                1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
                2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
                2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
                2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
                2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
                2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
                2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
                3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00
```

```
     Max.Eff.Inten.(mm/hr)=      53.00        39.80
                over (min)       10.00        60.00
     Storage Coeff.  (min)=       7.66 (ii)   54.09 (ii)
     Unit Hyd. Tpeak (min)=      10.00        60.00
     Unit Hyd. peak  (cms)=        .12          .02
                                                              *TOTALS*
     PEAK FLOW       (cms)=        .31          .35             .572 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.83           10.83
     RUNOFF VOLUME    (mm)=     210.50        68.94          111.41
     TOTAL RAINFALL   (mm)=     212.00       212.00          212.00
     RUNOFF COEFFICIENT   =        .99          .33             .53

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .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  (0206) |   Area    (ha)=  12.07
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62         8.45
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     400.00       400.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      53.00        39.34
                over (min)       10.00        60.00
     Storage Coeff.  (min)=       8.24 (ii)   58.48 (ii)
     Unit Hyd. Tpeak (min)=      10.00        60.00
     Unit Hyd. peak  (cms)=        .12          .02
                                                              *TOTALS*
     PEAK FLOW       (cms)=        .53          .59             .977 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.83           10.83
     RUNOFF VOLUME    (mm)=     210.50        68.94          111.41
     TOTAL RAINFALL   (mm)=     212.00       212.00          212.00
     RUNOFF COEFFICIENT   =        .99          .33             .53

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .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  (0204) |   Area    (ha)=   3.90
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.17         2.73
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=       1.90         1.90
     Length            (m)=     175.00       175.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      53.00        39.80
                over (min)       10.00        30.00
     Storage Coeff.  (min)=       4.14 (ii)   29.26 (ii)
     Unit Hyd. Tpeak (min)=      10.00        30.00
     Unit Hyd. peak  (cms)=        .15          .04
                                                              *TOTALS*
     PEAK FLOW       (cms)=        .17          .25             .413 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.17           10.00
     RUNOFF VOLUME    (mm)=     210.50        68.94          111.41
     TOTAL RAINFALL   (mm)=     212.00       212.00          212.00
     RUNOFF COEFFICIENT   =        .99          .33             .53

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB              |
| STANDHYD  (0104) |   Area    (ha)=   3.83
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.15         2.68
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .70          .70
     Length            (m)=     180.00       180.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      53.00        39.80
                over (min)       10.00        50.00
     Storage Coeff.  (min)=       5.68 (ii)   40.15 (ii)
     Unit Hyd. Tpeak (min)=      10.00        50.00
     Unit Hyd. peak  (cms)=        .14          .03
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .17          .22           .339 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.50          10.00
     RUNOFF VOLUME    (mm)=     210.50        68.94         111.40
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =        .99          .33            .53

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| STANDHYD  (0102) |   Area    (ha)=   2.08
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .62         1.46
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .70          .70
     Length            (m)=     100.00       100.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      53.00        39.80
                over (min)       10.00        30.00
     Storage Coeff.  (min)=       3.99 (ii)   28.22 (ii)
     Unit Hyd. Tpeak (min)=      10.00        30.00
     Unit Hyd. peak  (cms)=        .16          .04
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .09          .13           .222 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.17          10.00
     RUNOFF VOLUME    (mm)=     210.50        68.94         111.40
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =        .99          .33            .53

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| STANDHYD  (0100) |   Area    (ha)=   1.97
|ID= 1 DT=10.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39         1.58
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .30          .30
     Length            (m)=     300.00       300.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      53.00        39.34
                over (min)       10.00        80.00
     Storage Coeff.  (min)=       9.96 (ii)   70.62 (ii)
     Unit Hyd. Tpeak (min)=      10.00        80.00
     Unit Hyd. peak  (cms)=        .11          .02
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .06          .10           .142 (iii)
     TIME TO PEAK    (hrs)=      10.00        11.17          11.00
     RUNOFF VOLUME    (mm)=     210.50        68.94          97.23
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     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =        .99          .33            .46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0110) |   Area    (ha)=    .74
|ID= 1 DT=10.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .22          .52
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=        .50          .50
     Length            (m)=      50.00        50.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      53.00        39.80
                over (min)       10.00        30.00
     Storage Coeff.  (min)=       2.91 (ii)   20.59 (ii)
     Unit Hyd. Tpeak (min)=      10.00        30.00
     Unit Hyd. peak  (cms)=        .16          .05
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .03          .05           .084 (iii)
     TIME TO PEAK    (hrs)=       9.83        10.17          10.00
     RUNOFF VOLUME    (mm)=     210.50        68.94         111.39
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =        .99          .33            .53

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0216) |   Area    (ha)=    .98
|ID= 1 DT=10.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  61.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .60          .38
     Dep. Storage     (mm)=       1.50         4.60
     Average Slope     (%)=       1.50         1.50
     Length            (m)=      50.00        50.00
     Mannings n           =       .015         .250

     Max.Eff.Inten.(mm/hr)=      53.00        39.80
                over (min)       10.00        20.00
     Storage Coeff.  (min)=       2.10 (ii)   14.81 (ii)
     Unit Hyd. Tpeak (min)=      10.00        20.00
     Unit Hyd. peak  (cms)=        .17          .07
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .09          .04           .129 (iii)
     TIME TO PEAK    (hrs)=       9.67        10.00          10.00
     RUNOFF VOLUME    (mm)=     210.50        68.94         155.28
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =        .99          .33            .73

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  2.00
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0300) |   Area    (ha)=   3.35   Curve Number   (CN)= 83.0
|ID= 1 DT=10.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .16

     Unit Hyd Qpeak  (cms)=    .800
```

```
     PEAK FLOW       (cms)=    .434 (i)
     TIME TO PEAK    (hrs)=  10.000
     RUNOFF VOLUME    (mm)= 158.322
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =    .747

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0400) |   Area    (ha)=   1.71   Curve Number   (CN)= 84.0
|ID= 1 DT=10.0 min |   Ia      (mm)=   2.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .16

     Unit Hyd Qpeak  (cms)=    .408

     PEAK FLOW       (cms)=    .223 (i)
     TIME TO PEAK    (hrs)=  10.000
     RUNOFF VOLUME    (mm)= 160.558
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =    .757

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

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--------------------
| ADD HYD   (0208) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0206):    12.07    .977    10.83   111.41
        + ID2= 2 (0204):     3.90    .413    10.00   111.41
          ==================================================
          ID = 3 (0208):    15.97   1.314    10.00   111.41

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0106) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0102):     2.08    .222    10.00   111.40
        + ID2= 2 (0100):     1.97    .142    11.00    97.23
          ==================================================
          ID = 3 (0106):     4.05    .322    10.00   104.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0108) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0104):     3.83    .339    10.00   111.40
        + ID2= 2 (0106):     4.05    .322    10.00   104.51
          ==================================================
          ID = 3 (0108):     7.88    .661    10.00   107.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0200) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0108):     7.88    .661    10.00   107.86
        + ID2= 2 (0110):      .74    .084    10.00   111.39
          ==================================================
          ID = 3 (0200):     8.62    .745    10.00   108.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE PIPE (0202)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT= 10.0 min     |     Length       (m)= 500.00
--------------------     Slope      (m/m)=   .005
                         Manning n       =   .015

     **** WARNING: MINIMUM PIPE SIZE REQUIRED =   775.18   (mm)FOR FREE FLOW.
                   THIS SIZE WAS USED IN THE ROUTING.
                   THE CAPACITY OF THIS PIPE  =      .75  (cms)
```

```
     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .04     .476E+01        .0           .42        19.86
        .08     .132E+02        .0           .65        12.73
        .12     .239E+02        .0           .84         9.89
        .16     .362E+02        .1          1.00         8.32
        .20     .496E+02        .1          1.14         7.31
        .24     .639E+02        .2          1.26         6.61
        .29     .789E+02        .2          1.37         6.09
        .33     .944E+02        .3          1.46         5.70
        .37     .110E+03        .3          1.54         5.40
        .41     .126E+03        .4          1.61         5.16
        .45     .142E+03        .5          1.67         4.98
        .49     .157E+03        .5          1.72         4.84
        .53     .172E+03        .6          1.76         4.73
        .57     .186E+03        .7          1.79         4.67
        .61     .200E+03        .7          1.80         4.63
        .65     .212E+03        .8          1.80         4.63
        .69     .223E+03        .8          1.78         4.68
        .73     .231E+03        .8          1.73         4.81
        .78     .236E+03        .7          1.58         5.27
                                    <---- hydrograph ---->   <-pipe / channel->
                             AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                             (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0200)    8.62      .75   10.00 108.16       .64      1.80
     OUTFLOW: ID= 1 (0202)    8.62      .73   10.17 108.16       .61      1.80


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--------------------
| ADD HYD   (0210) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0208):    15.97   1.314    10.00   111.41
        + ID2= 2 (0202):     8.62    .725    10.17   108.16
          ==============================================
          ID = 3 (0210):    24.59   2.034    10.00   110.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ROUTE PIPE (0212)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1050.00
| DT= 10.0 min     |     Length       (m)= 360.00
--------------------     Slope      (m/m)=   .005
                         Manning n       =   .015

     **** WARNING: MINIMUM PIPE SIZE REQUIRED =  1129.73   (mm)FOR FREE FLOW.
                   THIS SIZE WAS USED IN THE ROUTING.
                   THE CAPACITY OF THIS PIPE  =     2.03  (cms)

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .06     .728E+01        .0           .54        11.12
        .12     .202E+02        .0           .84         7.13
        .18     .366E+02        .1          1.08         5.54
        .24     .553E+02        .2          1.29         4.66
        .30     .758E+02        .3          1.47         4.10
        .36     .978E+02        .4          1.62         3.70
        .42     .121E+03        .6          1.76         3.41
        .48     .144E+03        .8          1.88         3.19
        .54     .168E+03        .9          1.98         3.02
        .59     .193E+03       1.1          2.07         2.89
        .65     .217E+03       1.3          2.15         2.79
        .71     .240E+03       1.5          2.21         2.71
        .77     .263E+03       1.7          2.26         2.65
        .83     .285E+03       1.8          2.30         2.61
        .89     .306E+03       2.0          2.31         2.59
        .95     .324E+03       2.1          2.31         2.60
       1.01     .341E+03       2.2          2.29         2.62
       1.07     .354E+03       2.2          2.23         2.69
       1.13     .361E+03       2.0          2.03         2.95
                                    <---- hydrograph ---->   <-pipe / channel->
                             AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                             (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0210)   24.59     2.03   10.00 110.27       .93      2.31
     OUTFLOW: ID= 1 (0212)   24.59     2.02   10.83 110.27       .91      2.31


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--------------------
| ADD HYD   (0218) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0214):     6.94    .572    10.83   111.41
```

```
        + ID2= 2 (0212):    24.59   2.021    10.83   110.27
          =================================================
          ID = 3 (0218):    31.53   2.593    10.83   110.52

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0220) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0218):    31.53   2.593    10.83   110.52
        + ID2= 2 (0216):      .98    .129    10.00   155.28
          =================================================
          ID = 3 (0220):    32.51   2.683    10.83   111.87

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR (0222) |
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .5930       .9225
                           .0640      .0502   |    .6190       .9540
                           .0980      .2651   |    .6430       .9861
                           .1150      .5063   |    .6670      1.0742
                           .1220      .4899   |    .6900      1.1152
                           .1240      .5425   |    .9900      1.1570
                           .2770      .5951   |   2.3340      1.1930
                           .3420      .6476   |   4.5260      1.2310
                           .3920      .7002   |   7.3160      1.2680
                           .4340      .7528   |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0220)     32.510      2.683       10.83      111.87
     OUTFLOW: ID= 1 (0222)     32.510      2.693       10.33      111.86

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=100.36
                  TIME SHIFT OF PEAK FLOW         (min)=-30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  1.2019

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
     **** ERROR : CHECK THE STORAGE-DISCHARGE TABLE.
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--------------------
| ADD HYD   (0302) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0222):    32.51   2.693    10.33   111.86
        + ID2= 2 (0300):     3.35    .434    10.00   158.32
          =================================================
          ID = 3 (0302):    35.86   3.020    10.33   116.20

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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 FINISH
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